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SCIENTIFIC AMERICAN

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THE MODERN INDUSTRIAL DAREDEVIL.—[See page 460.]

SCIENTIFIC AMERICAN

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

Every Man to His Trade

AMONG the various collateral activities of the Navy Department, there is none in which greater efficiency has been shown than in the work of the Hydrographic Office. A most important publication of the office, which has won world-wide recognition, is the *Pilot Chart*—to be found in the chart house of every kind of ship that crosses the Atlantic, where it is recognized as one of the most effective safeguards of transatlantic travel.

The Hydrographic Office at present collects information as to dangers to navigation, treacherous derelicts, wrecks, drifting buoys, icebergs, and other matters of vital interest and importance to the mariner. Daily memoranda are issued, giving the positions of all dangers, and this is supplemented by a weekly bulletin containing this information in detail. The *Pilot Chart*, published at the end of each month, is not only a compendium of all this information, but it contains special articles by skilled officers that afford a fund of information totally inaccessible except through such a long-established and carefully-organized system as characterizes the Hydrographic service. The work of the Hydrographic Office has recently grown to be of such importance to mariners all over the world, that the maritime officials of the European nations have arranged for co-operation for the benefit of all mariners. The agency of wireless information has made the New York branch a sort of clearing house for this information. The system of collection and distribution of news is the most perfect that has ever been devised in the interests of the navigator. The Hydrographic Office receives wireless notice from ships at sea of dangers to navigation, and as promptly disseminates this by telephone, telegraph and wireless. It is the custom for commanders of ships on the day before going to sea, or on the day of sailing, to visit the various branch offices in search of the latest news in respect to dangers to navigation. In the case of several lines, this is done under a positive order from their head offices.

Furthermore, arrangements are being perfected whereby, as soon as notification of any danger on the transatlantic route is received, the news will be transmitted by cable to the Hydrographic Offices in Europe, to be there given to the various shore stations for further transmission to shipping which is about to depart or has departed for this side of the Atlantic. The *Deutsche Seewarte* of Germany thought enough of the American Hydrographic Office to request them to act as the headquarters for this service, this office being considered the one bureau best qualified to carry it out. It is a cause for gratification to know in what high esteem the office is held both here and in Europe. The *Pilot Chart* is accepted as accurate, principally because it is prepared by nautical men for nautical men. Thus a British marine officer in the *Atlantic Monthly* of July, 1909, writes: "Sailing ship captains owe many a smart passage to the wind and current charts supplied to them. As far as practical benefit to sea-faring is concerned, the American Hydrographic Office is far and away ahead of that of any other nation and is blessed by navigators of nearly every country under the sun."

In view of these facts, the SCIENTIFIC AMERICAN regrets to learn that a strong effort is again being made by the Weather Bureau of the Department of Agriculture to obtain control of the appropriation for the publication of the *Pilot Charts*. Furthermore, the Weather Bureau staff wish, forsooth, to prepare and publish these charts themselves. So far as our investigation has gone, the proposed change is strongly opposed by those very interests—the shipping companies and the captains of steamships and sailing vessels—for whose guidance the charts are issued. They claim—very properly, as it seems to us—that the compilation of such a purely nautical document should be done by nautical men possessed of the technical training and practical sea-faring experience which are the necessary qualifications for special work of this character.

Washington is prolific in boards of investigation, and this matter of the *Pilot Charts* was made the subject of one of these so recently as March, 1911, when a board composed of Gen. Crozier, Chief of Ordnance, U. S. A.; Mr. Ross, Director of the Bureau of Engraving and Printing; and Mr. Putnam, Commissioner of Lighthouses, reported, after careful consideration, in favor of retaining the publication of the *Pilot Charts* in the Hydrographic Office.

Far be it from us to say anything derogatory of the work of the Weather Bureau. It is constantly enlarging the sphere of its operations, and its work is well done; but in proposing to take over from the Navy Department a purely naval publication, the Bureau is showing something of that "vaulting ambition which o'erleaps itself." The Agricultural Department has its hands full in looking after its duties ashore; let it leave nautical matters to those who are technically qualified—particularly where they are as well administered as in this matter of the *Pilot Charts*.

Every man to his trade. If the Weather Bureau has suddenly discovered in itself some hitherto unsuspected qualifications for purely nautical work, why should it stop at the *Pilot Charts?* Why should it not assume the work of compiling the *Nautical Almanac*, now so ably—at least so we have fondly believed—done by the Naval Observatory? And this suggests astronomy. There may be some subtle relation between the Moon, the Milky Way and the crops; so why not make a clean sweep of it and place the Weather Bureau man at the eyepiece of the telescopes at Mount Wilson Observatory?

The "Bath-tub" Decision and the Patent Law

IN its way the decision of the United States Supreme Court against the "Bath-tub Trust" is far more important than that handed down in the "Rotary Mimeograph Case," for it not only upholds the Sherman Anti-Trust Act, but also clearly limits the use which may be made of a patent to control an entire industry. Yet, the decision is not revolutionary. None of the time-honored privileges of the patentee—among them the right to fix prices and to dictate the manner in which a machine may be used—is curtailed. Nor can the Sherman Anti-Trust Act be evaded by combinations of manufacturers, who disguise themselves as licensees under a patent.

The full significance of the "Bath-tub" decision can be truly appreciated if we contrast it with the Rotary Mimeograph case. The A. B. Dick Company, owners of the mimeograph patent, sold their product with the license restriction that it be used only in connection with ink, stationery and other supplies bought from the patentee. Beyond that there was no attempt to control the industry of manufacturing duplicating machines, either by the A. B. Dick Company or its licensees. The situation in the bath-tub case was quite different. The various manufacturers that constituted the Trust agreed under license restrictions to manufacture bath-tubs and other enameled ware with patented machinery, and to sell their products at a fixed price. Had that price been determined by the owner of the patents, as in the rotary mimeograph case, and had there been no combination of licensees the decision of the Supreme Court would have been quite different. In the rotary mimeograph case each licensee was absolutely independent of every other licensee under the Dick patents. In the bath-tub case the licensees formed a combination, subjected themselves to rules and regulations, among others not to sell their product to jobbers except at a price fixed, not by the trade and competitive conditions, not by the owner of the patents alone, but by a committee of six of their number. Jobbers were brought into the combination; for unless they entered they could obtain no enameled ware from any manufacturer-licensee. Is it any wonder that the Supreme Court held that the owners of patents cannot employ them to legalize a trust or agreement which violates the provisions of the Sherman law?

The decision does not in the slightest degree take from the owner of a patent any part of the exclusive rights secured to him under the Constitution and under our patent laws. It holds simply that the owner of a patent is not in any better position to form a trust than any other human being. His patent is not a magic cloak that protects him from judicial scrutiny. He has the right to control the manufacture, use and sale of his patented inventions; he can dictate the terms and conditions upon which he grants to others the right to use his patented machines, even to the extent of compelling the user to purchase from him certain patented supplies needed for use with the machine at such price as he may choose; he can fix the selling price of patented articles when sold by dealers at retail. But farther than that he cannot go. His licensees must be independent. He cannot organize them into a combination and permit them by agreement among themselves to fix the price at which the patented article may be sold.

Technical Questions and the Coroner

CORONERS' investigations of such disasters as the recent wreck at Westport have too often betrayed evidence of being affected by the popular prejudice against the railroads. This is always deplorable. Moreover, the discovery of the causes of such wrecks involves technical questions with which more often than not the coroner is unfamiliar; and hence, in weighing the conflicting testimony, he is at a serious disadvantage.

We commend to the attention of coroners throughout the country the course followed by the coroner who investigated the Westport disaster. To get an intelligent grasp of the problem, and safeguard himself against unconscious partiality, he journeyed far afield, personally inspected crossover conditions on several leading railroads, and consulted living authorities on physics as to the correctness of the theories which had been advanced as to the physical causes of the wreck. Being thus furnished for his task, it is not surprising that the coroner's report is comprehensive, without bias, and distinguished by an unusual grasp of the technical questions involved. The loss of life, he finds, was "caused by the criminal negligence of the engineer . . . and by the concurring negligence of the New Haven Company in allowing its passenger trains to use, at that place, a No. 10 crossover adapted for a safe train speed of 15 to 25 miles per hour only, instead of a No. 20 or other crossover adapted for a safe train speed of 35 to 55 miles per hour."

The course followed by the coroner in making a private personal study of the technical aspects of the question is so commendable, that we quote his statement in full: "In order that no injustice be done the New Haven Company by the above statement" (criticism of track conditions by a former employee of the railroad), "I personally visited various track points along the lines of many of the leading railroads . . . for the purpose of investigating track conditions and to become informed by competent authority as to the probable influence of such road-bed conditions as existed at Westport in causing derailment at that place." During his travels the coroner found that on the Pennsylvania railroad 90 per cent of the crossovers in use on its main lines for its high-speed traffic are of the No. 20 type.

From the Engineer of Maintenance of Way and the Assistant Chief Draughtsman of the New Haven Road the coroner elicited the statement that speeds of 45 and 47 miles an hour (the speed of the derailed train as testified to by witnesses) would be practicable on a No. 20 crossover, and he adds, "in addition to the above, practical railroad men of much experience, together with authorities on physics, have advised and convinced me of the feasibility of safely traveling over a No. 20 crossover at an increased speed above that testified to by the witnesses above quoted."

We believe that the impartial attitude of the coroner reflects the spirit of the thinking public. Certainly it is the attitude of the SCIENTIFIC AMERICAN. Although the wreck at Westport could have been avoided by the reconstruction of the crossover, it is not fair to assume or assert, as has been done so freely, that the recent accidents which have occurred on the New Haven Road since the Westport wreck have been due to the poor condition of the tracks. After making a personal examination at the scene of the recent derailment at Green's Farms, we do not hesitate to express our opinion that the accident was due, not as the daily press states, to "rotten ties and poor tracks," but to a minor mishap which might happen on any first-class railroad. The cars left the track at the trailing switch of a short crossover, it is true; but the train did not use the crossover, and the accident was due to a loose equalizer bar of the brake gear, which seems to have displaced the switch, derailing the rear half of the train. The ties at the scene of the wreck are stamped with the date of laying. A few were laid in 1908; some in 1910; and the majority in 1911 and 1912. There are tie-plates on every tie, and a substitution of screw spikes for the old track spikes was in course of being made. The track was in good shape.

Now here was a derailment of a character totally different from that which happened a few weeks before at Westport. In all probability the fall of the equalizer bar is chargeable to poor car inspection; and, if so, the responsibility for the derailment lies at the door of an employee. In the matter of accountability the derailment differs from that at Westport, which, according to the coroner's finding, is chargeable both to the employee and to the company.

Electricity

Automatic Telephones in New Zealand.—After studying the telephone systems of America and Europe the chief electrician of the Post and Telegraph Department of New Zealand has recommended that a full automatic telephone system be installed in Auckland, Wellington, Christchurch, and Dunedin.

German Gasoline-electric Car.—One of the light railway lines in Germany in the region of Königsberg, is making use of a new type of gasoline-electric car which is designed by a prominent Berlin electrical firm. It is fitted with a 4-cylinder 120 horse-power gasoline engine which is coupled direct to a dynamo giving 300 volts and 250 amperes. Current from the dynamo runs by way of a controller into two 85 horse-power electric motors which operate on the driving wheels through a speed reduction gearing of 4.3 to 1. The present car takes 100 passengers and weighs about 60 tons when fully loaded.

Hydro-electric Station for the Swiss State Railroad.—In connection with the extensive electric traction project which is on foot in Switzerland for equipping the State railroad lines, it is proposed to build a number of electric stations in order to make use of water power such as can be obtained from the Rhine, Adige, Rhone and Reuss rivers. Three of the proposed electric plants are to cost no less than $4,000,000 each, according to estimates, and the total expense in this direction will be $14,000,000. In this way a large amount of power such as is needed for operating the lines of electric railroad will be secured in various districts.

Tungsten Lamps or Fraud?—The engineer of a factory at Duisburg, Germany, was recently hailed to court on the charge of having tampered with his electric meter. The evidence against him was that his bill for current for the year was but 188 marks, as against the 587 marks for the preceding year. The accused engineer explained that he had substituted metal filament lamps for the carbon lamps and that this had resulted in the saving of 68 per cent. As there was no other evidence against him but that of the bill, the court decided the case in favor of the defendant.

Volta's Electrical Apparatus Discovered.—In a little old curiosity shop in a back street of a small Italian town Sir Henry Norman, M.P., recently came across a collection of electrical apparatus constructed by Volta, the Italian pioneer in electrical experiments. According to the *London Times*, which reports the discovery, the uncle of the grandfather of the present owner of the collection was Volta's cook and body servant for thirty years. On the death of the scientist, he left much of his experimental apparatus with his body servant and they have since passed down from generation to generation. The collection comprises a cupboard full of old apparatus, a number of books, portraits, papers and letters and some personal and domestic articles. Sir Henry Norman suggests that the collection be purchased and presented to the Royal Institution to remain alongside Faraday's original apparatus.

Pensions for Telephone Employees.—The Bell Telephone system has arranged for a fund of ten million dollars to provide pensions, sick benefits, and life insurance for its 175,000 employees. Men over sixty years of age and twenty years in service will retire on a pension, and the company has the option of retiring them at the age of fifty-five. The pension age for women is fifty-five years with the option of retiring them at the age of fifty. The pension will amount to one per cent of the average annual pay for ten years, multiplied by the years of service, and no pension will be less than twenty dollars per month. An employee who is totally disabled by accident will receive full pay for thirteen weeks, and half pay until he returns to work up to six years. Sick employees receive thirteen weeks' full pay and half pay for thirty-nine weeks. In case of death in the performance of work, the heirs will receive insurance equal to three years' pay with a maximum payment of $5,000. Death from other causes brings insurance in accordance with the years of employment, with a maximum payment of $2,000.

Electric Baggage Trucks.—The use of the baggage truck hauled or pushed by human muscle is being relegated to the limbo of out-of-date by certain progressive railroad and steamship companies. The new idea is a low-deck, heavily built, four-wheel, storage battery driven platform truck which moves the trunks and bags of travelers in a quantity and at a rate of speed which consists with the modern transportation of the passengers themselves. One truck of the new type, operated by the baggage man standing on a small platform at the end, has a rated capacity of 4,000 pounds and is geared for three speeds, the maximum being eight miles per hour empty and six miles per hour loaded. These little giants of transportation are finding favor also in mail handling and in commercial warehouse work. The efficiency in handling mail bags, for example, is shown by the fact that an electric truck can make five trips with a load of two tons in the time required for a hand truck to make four trips with a one-ton load; in other terms, a single electric truck does the work of two and one half hand trucks.

Science

Waterproofing Blocks of Wood.—A good way to harden small blocks of wood used in the laboratory is to boil them in olive oil for about five to ten minutes. Not only are the blocks hardened, but they may be used under water as the process makes them waterproof to a great degree. If desired to be used for collecting gases, that is for supporting bell jars under water, they may be made further waterproof by first boiling them in paraffine, then in oilve oil. This makes a wooden block hard and waterproof and every way well adapted for use in pneumatic troughs.

An Arctic Thunderstorm.—A Russian mining engineer describes in *Meteorologische Zeitschrift* a severe thunderstorm far within the Arctic circle. It occurred in Spitzbergen, where the writer was making explorations, on the 13th of last August. The storm lasted about eight hours, with incessant lightning, loud thunder, and heavy rain. Contrary to the prevailing belief, thunderstorms are by no means rare in the polar regions, though they are less common there than in lower latitudes. The storm in question, however, appears to have been altogether exceptional in violence and duration for that part of the world.

Crockerland Expedition.—Plans for the exploration of Crockerland have been so far developed by the American Museum of Natural History and the American Geographical Society that it is possible to announce the starting of the expedition from Sydney, Nova Scotia, on July 20th, 1913, under the leadership of Donald B. MacMillan, who was a member of the last polar expedition under Admiral Robert E. Peary. Besides exploring Crockerland the expedition will also make scientific observations along the northwestern coast of Grantland and the western coast of Axel Heidberg Land, its work being closely connected with that of the other expeditions that have been sent out by the Museum of Natural History and the Geographical Society to clear up the problems of those particular regions.

Rubber Plant Oil for Japanese Umbrellas.—The vegetable oil used in making paper umbrellas in Japan is pressed out of the seeds of the rubber plant. This oil is made in the various islands famous for oil and seeds from these plants. Sandy ground is favored for the cultivation of the plant and the oil is extracted from the seeds by presses. The yield of seeds is estimated at twenty bushels per acre. The annual production throughout Japan amounts to 350,000 bushels, from which over a gallon of oil per bushel is extracted. The oil before it is used is boiled and then cooled until it can be applied by hand to umbrellas with a piece of cloth or waste. No machinery or tools are used in applying the oil. When the oiling is completed the umbrellas are exposed in the sun for about five hours. This oil is also used in making the Japanese lanterns, artificial leather, printing ink, lacquer, varnishes, oil paper, and paints.

The Yearly Variation of Atmospheric Electricity.—It is well known that the electrical potential of the atmosphere reaches its maximum in winter, in our latitudes. The elaborate observations of potential made during Dr. Charcot's last antarctic expedition showed that at Port Charcot (65 degrees 4 minutes south) the average potential was 20 volts per meter during the southern winter, and 68 volts per meter during the southern summer. A writer in the *Meteorologische Zeitschrift* finds that these general results agree with observations elsewhere in the southern hemisphere. It appears, therefore, that the electrical field of the earth is stronger at the time of perihelion than at aphelion. Thus its fluctuation seems to be controlled by cosmical agencies and not by the terrestrial seasons. This conclusion agrees with current views concerning the emission of electrical waves from the sun.

Barnard's Observations of Gale's Comet *a* 1912.—Prof. Barnard of Yerkes Observatory made a series of photographs of Gale's Comet *a* 1912, with the Bruce 10-inch and 6-inch lenses. His observations are reported in the November, 1912, number of *Popular Astronomy*. The photographs showed a slender faint tail, whose maximum length was about seven degrees. There was very little change from night to night in the appearance of the tail. But on October 14th the tail was bifurcated at a distance of one half a degree from the head. "One rather remarkable feature about the comet," says Prof. Barnard, "was the persistence of a second very short tail at a very large angle to the main tail, on the south side of the head." The angle changed, becoming greater in each succeeding photograph, until in the last negative it was nearly at right angles to the main tail. Prof. Barnard intends to measure this angle carefully for a study of its changes. "It would seem improbable that the comet's tail had any rotation because this short tail remains persistently on one side of the comet throughout the observations." For a few days a very thin streamer about one half a degree long on the north side appeared at a very small angle to the tail. It was visible on October 3rd, 4th, 5th and 7th, in the plates, but was not visible on the 12th and the following dates.

Automobile

Hungary Motorizes Postal Service.—By order of the Hungarian Ministry of Commerce six hundred motor vehicles are to be purchased by the postal department. The equipment will include 250 small cars of about 10 horse-power for letter collection, to replace the present motor tricycles and bicycles; 75 combined passenger and parcel 'buses, and 275 delivery wagons of from 16 to 30 horse-power for parcels exclusively.

New World's Record for 1,000 Miles.—In an official race against time at the Brooklands track in England, a 15.9 horse-power (British R. A. C. rating) Sunbeam car established new world's records for all distances above 850 miles. The little car made the thousand miles in 13 hours, 8 minutes and 25.1 seconds, an average speed of 76 miles an hour. It started the long grind with an average speed of 78 miles and finished with 76.1 miles an hour, during the last hundred miles.

Novel Alarm Signal.—A new automobile alarm signal of unusual construction and equally unusual sound has just been invented by an Englishman. It consists of a gong placed in proximity to the revolving cooling fan, the blades of which hold small striker arms. By means of a Bowden wire cable the gong can be held against the fan, so that a penetrating but not unpleasant warning sound is introduced. The resulting note is said to be similar to that of a "slip carriage" coming into the railway station.

A Crank With Folding Handle.—A novel type of automobile cranking handle, in which the danger of a "kick" is materially reduced, has just been put on the market. The device consists of a folding handle, which, when released by the hand or torn from its grip by a "backfire," jumps into the same plane as the cranking arm, thereby reducing the width of the "danger zone" to one inch, instead of the five inches swept by a rigid handle. The power needed to throw the handle out of the way is furnished by a stiff spring.

Electrics for Theater Demonstrations.—In order to impress the general public with the suitability of electric automobiles for theater parties, one of the New York agencies offered free transportation from home to any of the Broadway theaters to *bona fide* theater parties. And several tests made by intending purchasers and mere curious show-visitors proved that the offer was genuine the agents actually *did* give the free rides—to the extreme satisfaction of their passengers. Although the cost of these trips is a considerable item in the expense account of the agency, it is said that it is the best advertising and publicity that could possibly be obtained.

Novel Armored Tire Appears.—An armored tire which is giving excellent service in trials at present conducted by the Royal Automobile Club of Great Britain is the Stelastic, manufactured in Westminster. The carcass of the tire resembles the ordinary pneumatic, but in the tread are interwoven a series of spiral springs, which offer an absolutely impenetrable shield to nails, glass and tacks, besides prolonging the life of the tire by reason of their great tensile strength. There are no less than 90,000 of these small springs in a 36×5 tire, and the only thing that can penetrate this armor is a long thin nail (part of a hatpin) entering at just the right angle to slip between the coils of the spring. It is also claimed that the tire does not get heated so quickly, as the steel springs disseminate the heat over a larger area.

Automobile for Town Use.—As a ladies' car for operation by ladies about town, the electric runabout has always been a favorite, although many women operate even large gasoline cars. Attempts are being made, however, to popularize small gas cars among women. The objection to cranking is removed by self-starting devices. The provision of a popular gas car for operation by a woman will demand the attention of both designer and inventor. It must be graceful and its engine must run smooth, while the engine control and transmission should be effected in the simplest way. It would not demand a high-speed capacity, and, if needed, some auxiliary heating devices must be supplied to keep the parts warmed up so that the starter would operate in the coldest weather. A car filling the bill at a reasonable cost should find favor among women.

Substitutes for the Pneumatic Tire.—It is safe to say that no subject has received more careful thought and attention from inventors within the last year than the tire problem. But not one of the scores of recently patented devices is quite equal to the plain artillery wheel fitted with pneumatic tire. Most of the devices employ springs to take up the jar between the tire and the axle and use solid rubber or similar material for the actual tread of the tire. Ingenious as many of these schemes are they are bound to be less serviceable than the pneumatic tire due to the number of moving parts which are subject to wear and breakage. Furthermore, there is a great tendency to rattle and jar whenever a small obstruction is met by the tire. So, although the problem of substitute for pneumatic tires has not been entirely solved, much work is being done and it is apparently only a matter of time until we may expect something even better than the present pneumatic tire.

Magnetic Chucks for Machine Tools

By Joseph B. Baker

TIME saving in manufacturing work is of great importance in the present day of rapid production and high cost of labor, and any device that will cut out the waste of even small amounts of time in a given operation is sure to be adopted by progressive manufacturers. In the machine shop the full economy in the operation of the machine tools is often not brought out by the workman, on account of the time and labor wasted in setting up or "chucking" the work of the tool. A familiar example may be found in the work of the shaper. This tool's efficient work on an iron casting or other piece, for example, can not begin until the piece has been secured to the bed of the tool. It requires care to make sure of a firm hold on the piece without buckling or distorting it by too much clamping force, and the piece may be of such size or shape that it cannot be readily held mechanically without leaving the clamp itself in the way of the cutting tool: so that this making ready to do the work is likely to be a tedious and time consuming job out of all proportion to the time required to do the actual work itself.

The magnetic chuck, a recently improved device for holding iron and steel pieces to be machined on shapers, planers, milling and grinding machines, and other machine-shop tools, is designed to remedy this condition, that is, to minimize idle time. The device is given its holding power by coils of insulated wire constituting a winding for generating a magnetic field at the face of the device—a field powerful enough to grip firmly the iron or steel piece simply laid on the face. As applied on grinding machines for grinding flat surfaces the magnetic chuck consists of a flat, horizontal or vertical plate of iron beneath the face of which the winding is arranged so as to give a series of magnet poles in the face. Terminals of the winding are brought out to a variable resistance operated by a convenient handle (by which the strength of the magnetism can be controlled by the operator on the machine tool) and to a switch for making the necessary connection with the electric lighting or power circuit of the machine shop.

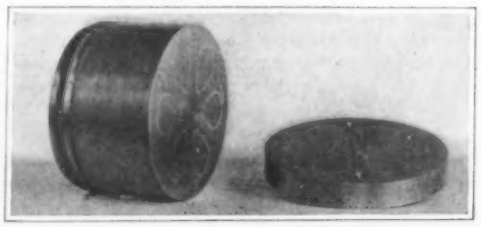
Direct current must, of course, be used to energize the magnetic chuck, and where the shop has alternating current only, it is necessary to provide a small motor generator to transform the current. The series of electromagnet poles which are made in the iron bed when the current is turned on are indicated in the horizontal chuck of this type shown in one of the illustrations. This chuck has adjustable end and side stops, raised above the surface of the bed, to help in holding the piece by taking the direct strain of the grinding wheel or other cutting tool which would otherwise tend to shift the piece along on the bed. A valuable use of this flat chuck is for the accurate grinding of thin pieces such as dies, knives for woodworking machines, gage plates, etc., which could not be held by mechanical clamps without distortion.

Rotary chucks are also made especially adapted for holding ball-races while being ground to finished size, and for grinding with high precision the pistons of gasoline engines and piston rings to fit ring grooves. Magnetic chucks may be used in groups, as in holding long pieces on a planer or milling machine or in holding a number of pieces of similar size and shape to be machined at one operation.

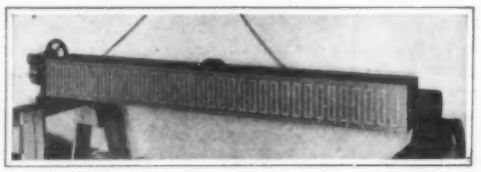
A magnetic chuck for practical machine shop use will inevitably be exposed to careless handling, as by being subjected to a higher voltage than that for which it is designed, and to oil, moisture and mechanical mishandling, and it is necessary to guard against the grounding of the wire windings on the frame of the machine tool and against burning out of the windings. Accordingly, the wire is insulated with a moisture-proof preparation of pure asbestos, which is also sufficiently heat-proof to protect the coil from burning out, or from becoming grounded, even should the temperature rise to 400 deg. Fahr. As an additional measure to keep the chuck in working order, the winding is made in the form of a set of independent interchangeable units which can readily be removed or replaced by the operator of the tool.

An interesting feature in the practical use of the magnetic chuck is the demagnetizing switch, which is provided to release the work quickly by overcoming residual magnetism.

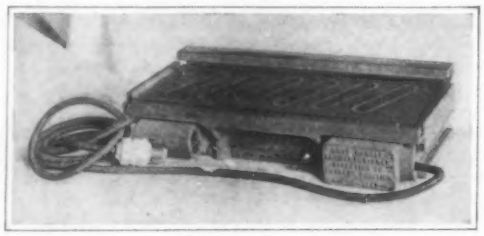
Rotary chucks for facing piston rings and the like with great precision.



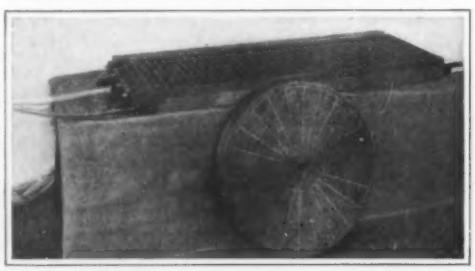
Rotary chuck with an auxiliary plate for holding ball races, etc.



Nine-foot swiveling magnetic chuck for grinding long knives.



Flat magnetic chuck with demagnetizing switch.



Flat chuck measuring 5 by 2 feet and 30-inch rotary chuck for surface grinding.

Microscopic Crystal Forms as Suggestions for Designers

ART forms are not produced by nature, for art and nature are radically different. A natural form may, however, be converted into an art form by a process of selection and transformation which makes it a fitting member of the regular and harmonious combination, created by and for the human mind alone, which is called a work of art. The natural forms which the artist finds most inspiring are those which offer the greatest possibilities of such artistic transformation and combination.

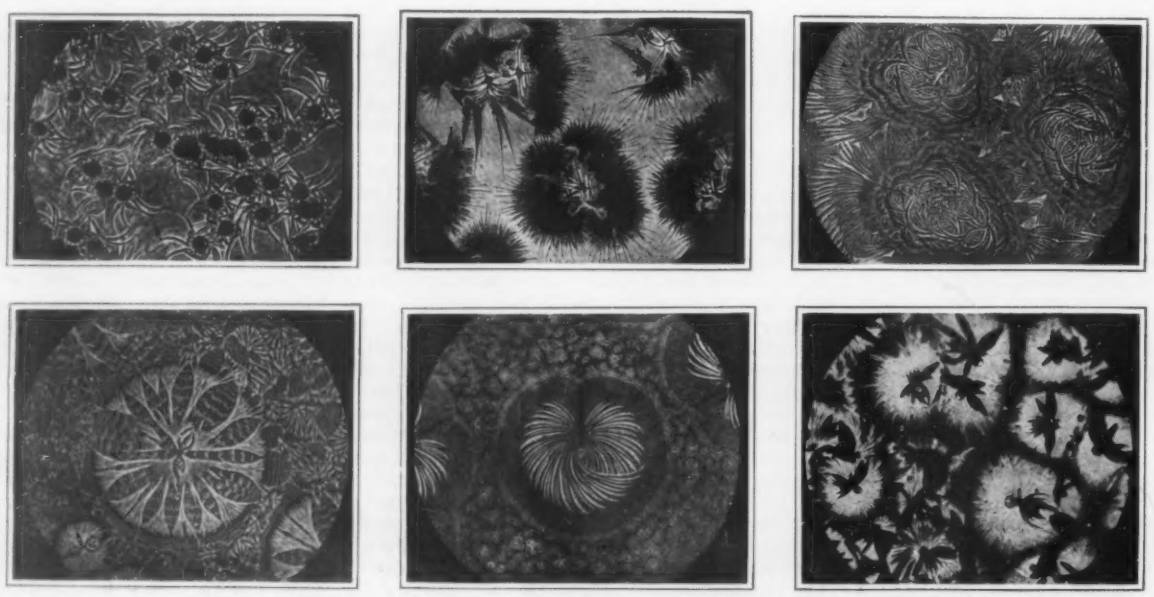
In painting and sculpture this process is very complex, because the artist seeks to produce an illusion (not an imitation) of nature, and also endeavors to create profound mental impressions by harmony of line, mass and color. In applied art it is complicated by the conflict between practical requirements and aesthetic ideals. The process is least complex in decorative art, with its simple laws and limited possibilities.

Pure ornament, applied to the decoration of surfaces, is the field of art which is farthest removed from nature and her laws, and which affords the freest play to the artist's fancy, but it is capable of giving only a vague expression to ideas and moods, except those associated with such of its elements as are manifestly taken directly from nature. The forms suitable for surface decoration comprise abstract and geometrical forms, which depend for their effect entirely upon rhythm of lines and masses, and those natural forms which derive their beauty from superficial contour, pattern and color, in contradistinction to forms unthinkable in two dimensions, such as human and animal figures, which appear unnaturally and violently flattened when used as superficial ornaments. In many cases the effect of the elementary ornamental forms is subordinated to the effect of a harmonious combination of them, repeated at regular intervals. Textile designs, for example, consist of such recurring groups of subordinated elements.

As decorative art departs so widely from nature, which it merely suggests in some of its lines and forms, until in geometrical designs it becomes the embodiment of an abstract law, the natural forms which it should find the most useful and inspiring are those which are produced by natural forces acting in a plane.

A few such forms are shown in the accompanying illustrations, which represent micro-photographs of minute crystals, formed by the evaporation of various solutions on microscope slides. The formation, movements and arrangement of these crystals may be regarded as abstract expressions of natural forces acting in a plane.

These crystalline forms are not art forms, as has already been noted, but they present so many points of contact with the art of surface adornment that it seems proper to recommend them to decorators and designers as worthy objects of study and probable sources of inspiration.—*Adapted from Prof. K. S. von Eisenwerth.*



Crystal forms as suggestions for decorators and designers.

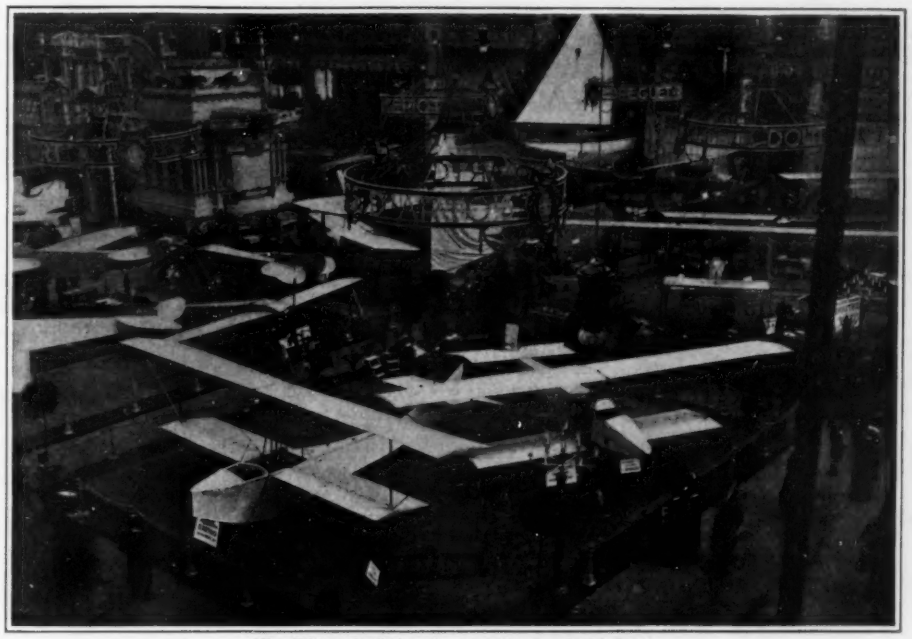
A Heat-proof Bronzing Fluid.—Bronzing fluids as ordinarily made do not stand very high temperatures. Where this is desirable use the following mixture: Cut "gear varnish" or any hard varnish with turpentine to the consistency of thin molasses, add ten per cent of amyl acetate and stir in aluminium powder or other bronzing powder to suit.

The Fourth Paris Aviation Salon

Review of the Show With Mention of the Improvements During the Past Year

THE annual aero show in Paris this year differs from those formerly held in the fact that it was devoted entirely to aviation. There were no dirigibles on exhibition, and there were but two balloons to remind one of the manner in which the air was formerly navigated from the days of Montgolfier.

The number of machines on view increased from forty-three last year to seventy-seven this year. Of these, twenty-seven were supplied by the French government, and were part of the fleet of military aeroplanes which is soon to be increased to well over four hundred machines at an expenditure in 1913 of $5,000,000 in addition to the $4,000,000 spent this year. Of the machines exhibited, forty-six were monoplanes and twenty biplanes, so it can be seen that the single-surface type has become far more popular, and is rapidly displacing the "match-box," as some of the monoplane's disciples have dubbed the biplane.



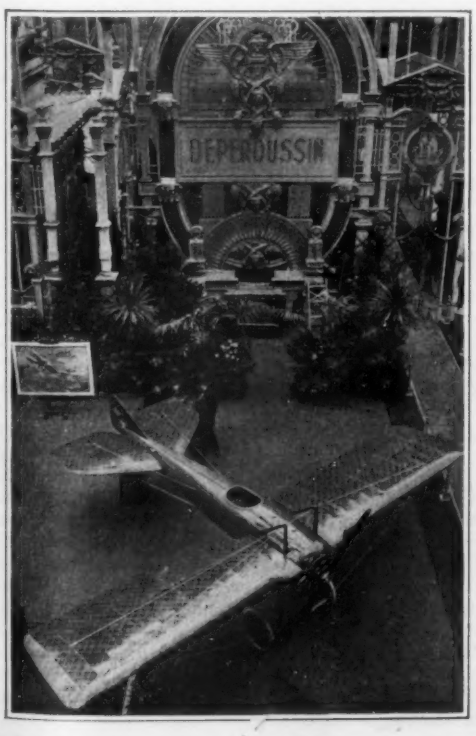
The D'Artois flying boat and torpedo biplane.

In both biplanes the motor is in the body behind the aviator's seat. In the torpedo the propeller is at extreme rear end of body.

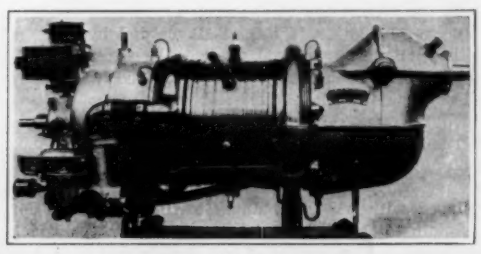
The most noticeable feature of the show this year was the fact that nearly all the machines are intended for military use. Officers from the various foreign governments were constantly inspecting these machines, and giving orders for considerable numbers of them throughout the two weeks of the show. The contests for military aeroplanes, held in France a year ago and in England last September, have brought forth many excellent war machines of a staunchness and stability that could hardly be surpassed. While the monoplane is used chiefly for speed work and scouting, the biplane is also used for the latter purpose and especially for bomb-dropping, as it is capable of carrying great weights. The monoplane, too, for that matter, has shown itself to have a very high capacity in this respect.

The development of the hydro-aeroplane, or flying boat, as it is now becoming, has been rapid during the past year. Introduced into France last March by Louis Paulhan, when he appeared at the Monaco meet with a Curtiss hydro-aeroplane, these machines have found favor with all aviators, and have increased in considerable numbers. Practically all the well-known manufacturers equip their monoplanes or biplanes with floats for the purpose of converting them into water machines. The next development was the Donnet-Lévêque flying boat, in which the monoplane body of a biplane was made to serve as a single step hydroplane, forming a substantial boat, and thus the make-shift floats were done away with. A large number of flights were made by Lieut. Conneau in one of these machines, and Curtiss is now producing a similar machine in this country. In the Donnet-Lévêque and Curtiss flying boats, the motor is placed high up beneath the upper plane, and carries the propeller on its crankshaft at the rear; but in several which were exhibited at the show, an example of which is the D'Artois, shown in our illustration above, the motor is placed in the hull and drives the four-bladed propeller by means of sprockets and chain. This arrangement lowers the center of gravity, but does not seem to disturb the stability of the machine, as it has generally been supposed a low center of gravity will do. The land biplane shown in this same illustration is constructed along the lines of the Paulhan-Tatin torpedo, that was exhibited last year. The motor is placed in the fuselage behind the aviator's seat, and drives the propeller at the extreme rear end of the fuselage by means of a long shaft. Gallaudet, in this country, constructed a monoplane for the international cup race along these lines last spring, but smashed his machine in its trial flight. He is now working on a hydro-monoplane of the same type, which has been found to be very fast. The D'Artois is the first biplane having the propeller at the rear of the body. With a 50 horse-power motor it is said to develop a speed of 65 miles an hour. These machines have another novel feature, namely, the turning of the wings about a central main longitudinal for the transverse stability, instead of warping the wings. They were the only example of lateral stability maintained by other means than warping. Of course, the angle of incidence is varied by this method of control, which is the same as was used by Mr. Gallaudet on his monoplane mentioned above. Practically all the machines exhibited used warpable wings or ailerons for the transverse equilibrium.

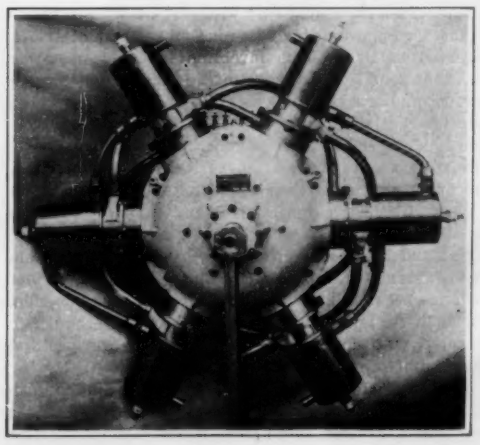
There were a number of new devices for automatic stability shown, and models or full-sized machines for their demonstration. The Doutre stabilizer—a vertical plate in front of the machine which moves according to the variation in pressure and sets the elevator correspondingly—was shown this year fitted to a full-sized biplane. M. Huguet exhibited a similar stabilizer, which is said to be an improvement upon the Doutre. The principal machine having automatic stability, however, was that of the Moreau brothers. This was a large biplane fitted with a 70 horse-power motor and an underslung car pivoted to swing and act as a pendulum. Messrs. Albert and André Moreau have been developing their "Aerostable" for the past ten years, and the latter made successful flights two years ago in a monoplane having an underslung car used as a pendulum for the purpose of setting the elevator. He has flown over 12,000 miles since April, 1911, in this machine, and on



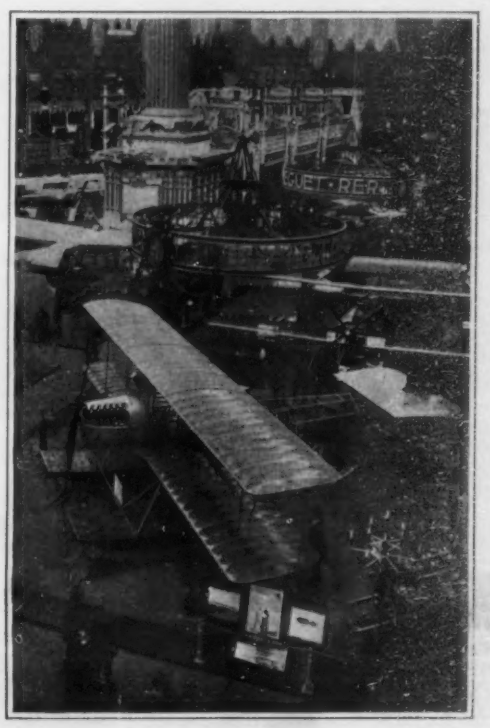
The 80 horse-power Deperdussin "Monocoque"—the fastest type monoplane.



Salmson parallel-cylinder motor.



L'Aviator two-cycle circular motor, which is water cooled.



100 horse-power Astra triplace hydro-biplane, winner of St. Malo-Jersey race.

several occasions has flown for ten minutes at a time with his arms folded. On October 15th last, his monoplane carried four men, making a total weight of 1,760 pounds for a surface of 258 square feet. The Moreau machine was the only really new aeroplane on exhibition. MM. Moreau expect shortly to bring out an automatic device for maintaining the transverse equilibrium as well.

Besides the machines above mentioned, the two remaining features of the show were the "Monocoque" —a type of monoplane having a cylindrical torpedo-shaped body, as shown in the Deperdussin we illustrate —and the hydro-aeroplanes. The "Monocoque" was developed from the Paulhan-Tatin torpedo, above mentioned. The bodies of these machines are constructed of veneer, tulip wood having been found the best for this purpose. They are very strong and smooth, and produce very slight resistance because of their shape, and diminished skin friction because of their short length. Louis Blériot has brought out a machine of this type having a half-round body on the under side. He has also changed the undercarriage of his monoplanes so that they now have two wheels with a connecting axle and a central upturned skid. His latest invention is a hydro-pneumatic shock absorber for the central mast extending down to the undercarriage.

The development of the all-metal aeroplane has been quite rapid during the past year. A half dozen or more constructors exhibited machines made largely of steel tubing and sheet aluminium in the Salon this year. Robert Esnault-Pelterie, it will be remembered, was the first to construct a steel-tube fuselage, and this is still used on the R. E. P. monoplanes. The Hanriot firm is now following suit, and also the Clement, and one or two others. Last year the Tubavion all-metal monoplane was the only one of its kind, while this year there were several, the chief one being the Hanriot. Leading authorities agree, however, that a proper combination of steel and wood is far more satisfactory than a machine built entirely of metal.

The modifications of the various types of aeroplanes on exhibition were slight, with the exception of but two points. First, there has been a general lowering of the center of gravity on many of the aeroplanes, and second, they have been fitted chiefly with non-lifting tails. In the case of the biplanes, single-surface tails are generally employed instead of double, and only a few biplanes are fitted with elevators both fore and aft. There has been a slight endeavor to obtain automatic longitudinal stability by means of wings having a reverse curvature toward the rear, in accordance with Turnbull's experiments repeated latterly by Eiffel. The Besson and Bristol (English) monoplanes have such wings. On the whole, however, the curved wing has been displaced by the almost flat wing, having a sharp entering edge in order to reduce the resistance and allow of the highest possible speed being maintained. Speed in itself produces stability, and most of the monoplane constructors, at least, aim to attain the greatest possible speed.

When once the need of Europe for war avions is filled, the French and other nations will doubtless turn their activities toward the production of commercial aeroplanes. The hydro-aeroplane, or hydraeroplane, has done much toward the commercializing of aviation, and no doubt another year will see many water aeroplanes in use in the United States, as well as throughout Europe.

A very complete description of the most interesting machines and motors at the Salon will be found in the current SUPPLEMENT, 1926.

Some Developments in Wireless—II

By John Hays Hammond, Jr.

(*Concluded from page 458, November 23, 1912.*)

The Possibilities of Duplex and Quadruplex Wireless.

The development in the immediate future in wireless lines, it seems to me, will closely parallel the advances made in wireless telegraphy and telephony. Facilities to increase the amount of intelligence handled will be one of the first developments. Duplex and ultimately quadruplex wireless systems will come into general use. The Marconi Company has already developed a duplex system and is employing it for commercial work. The problem of multiplex wireless telegraphy is again intimately connected with the problem of selectivity; for it is necessary to individualize each individual message so that there shall be no intermixing or interference in simultaneous transmission or reception.

In wireless telephonic work, we may confidently expect a development that will bring it into general use. The necessary apparatus will be simplified and made fool-proof to an extent that will allow its use on the farm, in isolated mining camps, and in many places where a line wire connection would mean the expenditure of thousands of dollars. The flexibility of the system, its small initial cost, and the advantage gained in doing away with the need of central stations will bring the wireless telephone into commercial favor. Greater selectivity along this line is a present day problem and presents greater difficulties than the attainment of non-interferability in wireless telegraphy.

High Speed Wireless Telegraphy.

Eventually, I believe that it will be possible to develop high speed systems of wireless telegraphy for the transmission of news. To-day, we have rapid wire telegraphs capable of transmitting over wires at the remarkable speed of 5,000 words a minute. Perhaps along lines of chemical research a substance will be found which will change color under the action of minute electrical oscillations. With the discovery of such a suitable substance we could duplicate the rapidity of the Delany system in wireless transmission.

A further important development in electro-magnetic wave signaling is embodied in the inventions of Ernst Ruhmer, of Berlin, and Major Squier, of the United States Army. These two brilliant scientific researchers evolved the idea simultaneously, but independently, of applying wireless transmission to wires. By utilizing the principles of electrical tuning to wire telegraph and telephone systems, it has been found possible to multiplex a line and thus transmit a far greater number of messages simultaneously than can be done with present day installations. The telephone system would benefit materially with the adoption of such a system after it had been perfected, and the increased cost of operation would not be, as it is now, proportional to the increased number of subscribers. However, certain essential difficulties still stand in the way of the immediate general adoption of this system, one of which is the effect of forced oscillations produced on the receiving apparatus by the transmitter at the same station.

Outside of its use as a valuable means to signal through space, the electro-magnetic waves of the future will accomplish results of even greater value to humanity. To-day we are just on the threshold of a great science which Nikola Tesla has aptly named "telautomatics."

Action at a Distance Wirelessly Controlled.

Telautomatics is the control of a number of mechanisms from a distance with only a single conducting medium, besides the ground, connecting the operator and mechanism operated. The most spectacular branch of this art is in the wireless control of mechanism. Torpedoes have been guided by wireless. Clocks are being run to-day in Europe by wireless. Bells on buoys have been made to ring from the deck of passing steamers. A railroad locomotive has been operated without an engineer in the cab, and numerous other feats have been performed with only a ground and the ether connecting the operator and mechanism operated.

Prof. Ernst Wilson in 1897 controlled a torpedo on the Thames by Hertzian waves. He is the pioneer inventor in this art. Since his time a large number of telautomatic patents have been granted, both here and abroad.

This electro-magnetic arm which we can stretch through space, and use to control machinery, is the next great step in the stairway of progress following the annihilation of distance by the electro-magnetic voice. I believe it will be an important scientific factor in the civilization of the future.

To-day navigation is being safeguarded by the use of the Bellini Tosi system of directive wireless telegraphy. Bellini and Tosi have developed what they call a Hertzian azimuth compass. At a demonstration which I witnessed in Paris, it was revealed that this instrument would show within one degree at a distance of 50 miles the actual direction of reception of a wireless message. This means that when lighthouses are equipped with wireless plants, it will be possible for a captain to ascertain his exact position by comparing the direction of reception of two signals sent from two different lighthouses. The lighthouses will be distinguished from each other by different acoustic notes.

Another important invention is that of R. H. Marriott, patented in 1909. This invention is based upon the fact that sound waves travel at a specific rate through water, and wireless waves travel at such a high velocity that their time of transit from a nearby station is a negligible lapse of time. Mr. Marriott, therefore, proposes to have a submarine bell sound simultaneously with a wireless signal at a lighthouse or on a ship. The navigator then listens in, and calculates the difference in time between the reception of the bell signal and the reception of the wireless signal. From this difference of time, he immediately knows the exact distance between his vessel and the lighthouse or ship. Thus, in fogs we will be able to navigate, thanks to wireless, with an exact knowledge of our bearings and the distance we are from other vessels.

The transmission of photographs is already an accomplished fact in wireless, and when television is possible over wires, there is no doubt that we shall be able to see over the edge of the horizon by wireless.

Prof. Fessenden has shown a method of transmitting handwriting by wireless and there are newspaper rumors of an Italian system to transmit drawings for military purposes.

The important question is not, what it is possible to do in the future in wireless, but what is it practical to do. Economic considerations will determine this.

Whatever may be the ultimate developments of wireless, it is evident to-day that we are just entering into a field of science whose attainments will have a far-reaching influence on the shaping of our civilization.

The Rediscovery of America

THE Englishwoman who remarked, *àpropos* of our civil war, that it was no wonder the North and South had become disunited in spirit since they "were only connected by a narrow isthmus," may conceivably have been a woman of parts and education according to European standards. American geography hovers on the outskirts of Old World curricula—a thing for the hobby-rider or the advanced specialist. This is true in whatever sense we use the elastic term "geography."

We believe, however, that dating from the autumn of 1912 our transatlantic brethren will have no excuse whatever for not knowing as much about our country as they know, for instance, about Turkestan or the Gold Coast. It was an heroic idea on the part of the American Geographical Society, in commemoration of its sixtieth birthday, to corral the most eminent geographers and geographical teachers of the Old World, place them aboard a special train under the strict surveillance of Prof. W. M. Davis (a genius at "personal conducting") and a staff of polite but inflexible assistants, and force them, whether they would or no, to see about ten times as much of this country as the average enlightened American may hope to see in the course of a lifetime. The Transcontinental Excursion of the American Geographical Society, which began in New York in August and ended in the same city two months later, was, in many respects, the most conscientiously executed exploring expedition on record, and is certainly likely to be one of the most momentous in its results. The journey covered about 13,000 miles, including 1,000 miles of automobiling. The country along the route simply turned itself inside out for the benefit of the forty-three foreign visitors. American hospitality outdid itself. Everything that could conceivably interest the foreigners, and possibly much that could not, was trotted out, exhibited, put through its paces. The local magnates, from State governors down, were on hand at the gates of the cities to bid the visitors welcome; banquets and receptions filled all the intervals of sight-seeing. The choicest products of every locality visited—fruit, flowers, and what-not—were heaped upon the travelers, loaded aboard their train, even sent to their European addresses to await their return. Quite the most remarkable fact in connection with the trip was that, with one exception, the Europeans proved physically equal to the strenuous round of sight-seeing and entertainments. The next most remarkable fact was that representatives of thirteen countries spent two months in one another's company, mostly in close quarters, without the slightest breach of amicable relations.

Except the last lap of the journey, from Washington to New York, the trip was all made on the same train, and only one slight change in the itinerary planned in advance was made necessary by the fact that the party was delayed 24 hours at the Roosevelt Dam by an almost unheard of rain of two inches, which made the mountain roads impassable for automobiles. A daily bulletin, containing the announcements and information of the day, was printed on the train. A feature of the equipment was a "Guide Book for the Transcontinental Excursion of 1912," of 144 pages, compiled by Prof. Davis. A well-stocked library was carried along, containing books and maps relating to the region traversed. About a dozen American geographers made the whole journey, and some sixty more accompanied the party in relays, as guides to the expedition. The enterprise was admirably organized from beginning to end.

It is safe to assert that the class rooms and lecture halls of Europe will for some time to come be the distributing centers of accurate, first-hand information about the once *terra incognita*, America.

Sugar Beets in Dutch East Indies

A MOST interesting experiment in the cultivation of sugar beets has recently been made near Batu in Malang, Java, at an altitude of 2,600 feet above sea level. The beets were grown from seed obtained from Erfurt in Germany, and were a great success, weighing on an average from two thirds of a pound to a pound without the leaves. That is much heavier than those grown in Europe. The content of sugar was 15½ per cent, whereas in Europe the average is less.

According to a scientific computation the production of sugar per acre would be 2½ times as great as that in Europe.

Does not this means suggest the possibility of sugar beet cultivation in the Philippines and other American colonies?

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Water Propellers for Ships

To the Editor of the SCIENTIFIC AMERICAN:

I observe in SCIENTIFIC AMERICAN of September 21st—the most interesting and instructive paper that as I think now exists—you mention under the heading of "Auxiliary Sailing Schooners" the suggestion that they should be equipped with auxiliary engines.

Will you permit me to suggest that it might be worth the consideration of the owners of such vessels, whether they might not advantageously adopt the water propeller. Your readers will no doubt be aware that the water propeller has great advantages over the screw in regard to economy, as its action on the ship takes immediate effect, and there is none of that waste through the screw requiring to be revolved up to the then speed of the vessel before the auxiliary takes effect.

The water propeller was tried during the sixties, probably in the year 1864.

The only fair trial that it had, as I thought at the time, was in the case of three gunboats, the "Vixen," "Viper" and "Waterwitch." The vessels were, I believe, identical in form and in power exerted. "Vixen" and "Viper" were screws, the "Waterwitch" had the water propeller. The result showed that there was practically no difference in speed; and it should be remembered that no sufficient trials were ever made to ascertain the best position and mode of exit of the water.

The handiness of this propeller for starting ahead, stopping, and going astern was greatly superior. The trouble with the screw having to be feathered is avoided. The motion of the centrifugal pumping engine, acting like a great gyroscope, tended to steady the ship.

I should add that a rough estimate was made, when an ironclad was rammed in the Irish Channel and sank in a little over an hour, many years ago, as to the amount of water that was likely to have come into the ship, and it was found that if she had had a water propeller, the amount that came in through the hole would only have been sufficient to give her three quarters speed.

Talmer Slough, England. J. NUTTALL.

Non-astringent Persimmons

To the Editor of the SCIENTIFIC AMERICAN:

In the issue of October 26th of the SCIENTIFIC AMERICAN I notice an article on "Non-astringent Persimmons." In this connection I wish to state that I have bought at fruit stands in a number of Florida towns, during a number of years past, a variety of Japanese persimmon locally known as "apple persimmon," which is so called on account of the fact that, when taken from the tree, this particular variety is free of all tendency to pucker, and can be eaten at once just as would an apple. When picked ripe, it is firm and fully colored, good flavored and sweet, and decidedly pleasant to the taste. When bitten, the bite comes out with a crisp snap.

I at one time lived next door to a man who grew some of this variety of persimmons in his yard, and know that they were treated in no way to give them the qualities mentioned. E. W. PRICE.

Tampa, Fla.

Ocean Currents

To the Editor of the SCIENTIFIC AMERICAN:

About the time the "Titanic" was sunk, I read an article in your paper in which the Labrador current was alluded to in terms which seemed to indicate that its cause or origin was obscure or unknown.

Looking the matter up in several encyclopædias since, I find that there is an almost total lack of definite information as to any of the ocean currents, including the Gulf Stream.

For many years I have had the idea that the Gulf Stream, as well as the ocean currents of the eastern hemisphere, were the result of the inertia of the waters of the oceans against the rotation of the earth, piling up enormous masses of water against the eastern shores of both hemispheres, and flowing away on lines of least resistance.

A casual study of the streams from this viewpoint will, I am sure, make my idea perfectly plain, and, considered in connection with the heat at the equator and the cold at the poles, provide an accurate determination of the source, direction, and effect of every current in the seas.

This idea may not be new, for, as stated above, I have held it for a long time, but certainly such sources of information as have been available to me recently do not convey any definite idea of the causes. If there is any novelty or value in this suggestion, please give it to your readers; otherwise, please destroy this letter and kindly direct me to some suitable writings on the subject.

RICHARD A. MAGILL.

Atlanta, Ga.

Solving the Christmas Gift Problem

A LARGE manufacturer recently wrote us as follows:

> "We send out Christmas presents to some of our customers. Suppose we sent you from twenty to fifty subscriptions, what is the lowest price you could make us."

We replied to our correspondent's letter and quoted a special price. The following extract tells the story.

> "Go ahead and have one hundred and fifty cards printed reading as follows:

> We take much pleasure in advising you that the
> **Scientific American**
> will be sent to your address during the coming year,
> with the compliments of _____

Our correspondent is not only saved the worry and bother of attending to the details of having the gifts delivered at the proper time, but the arrival of the SCIENTIFIC AMERICAN each week during the year serves to recall to the minds of the recipients pleasant memories of the donor.

If it is your practice to give Christmas presents to your customers or employees, a year's subscription for SCIENTIFIC AMERICAN, or a copy of the "SCIENTIFIC AMERICAN Reference Book," or better still, both in combination, makes an ideal gift, that is of permanent value to the recipient.

A Promise Unfulfilled

To the Editor of the SCIENTIFIC AMERICAN:

I cannot help from feeling that it is my duty to express myself along the lines of thought you conveyed so accurately to the scientific and literary world in your paper published September 21st, 1912.

This subject, "A Promise Unfulfilled," dealing with America's slow advancement in aero-navigation, is a serious subject, and the causes are just as you say, "More national than individual." I have always thought that large or good-sized cities were the places to organize and get money for this work. This may be so in the North, but it has not been so in this part of the South, and to illustrate to you that what I say is true, the following outline should be convincing:

A little over two years ago two men started actual work on this subject in one part of this city. About the same time two other men started work along the same subject in another part of the city. Now, I am in a position to know that not a single man of the four had any intention of building a flying machine, jumping into it, and flying off, as 'tis the dream of so many people; for they all knew that experimenting, studying, and hard work were necessary first. There was little capital available among the four men, but by two men devoting their entire time and using to good advantage the little money they had, flying models and gliders were constructed; later the experimenters consolidated, and large machines were constructed. One machine was fitted up with a 20 horse-power Buick motor, and with this machine the men made use of such experiences as they could get traveling and falling around on the ground. No attempt was made to fly, and "Why not?" was explained to a number of people.

Soon the time came to do more. Large, up-to-date machines were constructed of the best material and workmanship available (following plans obtained from a northern concern). To install in one of these machines a cheap motor would have been foolish, and to buy a good motor the sum of $225 more than what they had on hand was necessary. They tried to raise this amount here. Every poor man and rich man was cornered; they had material on hand worth four times $225, and this was offered for collateral but they were still unable to raise the required sum here. I will say, just here, that this city has about forty thousand inhabitants, a number of whom are of considerable wealth; it is a city of self-pride and enthusiasm; and a boaster of its place in history. No one was asked to give the money away, but nevertheless on no condition could the $225 be obtained for the purpose of experiments in aero-navigation.

About 21 miles from this city there lies a little town of about four thousand people, that is called by some people here a country town. Regardless of what it is called, right in the town of Gastonia, N. C., they obtained the $225 and a little more to carry on their work. A $1,200 Maxi motor was ordered at once.

What America needs along the line of preparing a machine or scientific article for the market is a little more of the German spirit. He organizes a company first for the purpose of experimenting with the articles. The Germans have confidence in what they are doing, they expect results, and they get good results. This nation as a whole tries to get rich too quick.

When you compare this nation's strength in aviation to that of a single foreign nation, by representing that foreign nation's strength as the largest flying machine, and this nation's strength as a tiny butterfly, every true-born American should fell ashamed. Flying machines may seem foolish to a lot of people; but when one reads in the daily newspapers of what the machines have done in time of war, one should stop to think what this nation could do in time of war. They should know that most of the foreign countries are prepared to fight with the help of air scouts, while we are not.

Patience and a little more confidence will bring results, especially in a country which is the birthplace of the men who traveled long and hard roads to give this nation as well as to the rest of a world a concrete foundation on which rests the successful flying machine.

Charlotte, N. C. A. M. WEBB.

Automobile Toll Roads

To the Editor of the SCIENTIFIC AMERICAN:

If charters were granted by States to corporations for the purpose of building important State and interstate roads for the exclusive use of rubber-tired motor-driven vehicles, the plan would, I believe, be the best way to secure a good many economically built and carefully kept roads.

For such a road to pay dividends it would have to have easy grades and as smooth a surface as could be possibly maintained. Such a road would make possible the use of cheap automobiles, which would be used in great numbers if only proper roads were built for them.

The corporation could keep motor buses and trucks for hauling passengers and freight on such roads for the benefit of the public as well as the corporation, all vehicles to have the same rights on the road.

All vehicles being rubber tired and motor driven would probably not be so wearing on the road as where rubber-tired and iron-tired vehicles are used on the same road. Such a road should not cross public highways at the same level, but go over or under them, not only for safety but also for the purpose of easy collection of tolls. Tolls could be collected in this manner: station agents could be kept at intervals of from four to six miles along the road, where automobiles could be allowed to go on or off the road.

Parties taking an automobile on a road at a station would have to purchase a ticket, and when arriving at the station which the ticket called for, they would have to deliver the ticket and the agent would permit them to leave the road.

In support of the automobile toll road idea I will refer to the great railroad systems of this country; how they have contributed so much to the development of the country under corporation management; how competition has stimulated inventions that have improved and cheapened transportation.

The same thing would happen if automobile toll roads were constructed and managed by corporations. Efficient work would be done in construction and maintenance; competition would stimulate experiment and invention, and the result would be of great benefit without in any way interfering with present public roads, but rather stimulating the building and improving of them.

No considerable number of citizens would care to advocate public ownership of railways; the only general desire has been for some form of just regulation. This being the case, why not have automobile toll roads, built by corporations, between important cities and towns, instead of having such roads built in a haphazard way by counties, at great cost and with no provisions for maintenance.

Stanberry, Mo. CLIFTON R. SUMMERS.

The Gyroscopic Torque of a Rotating Body

To the Editor of the SCIENTIFIC AMERICAN:

Apropos of Sir Hiram Maxim's suggestion, in your issue of October 26th, to determine by a special research the gyroscopic torque of a rotating body, permit me to say that the required value of the torque can be found by use of the simple method and well-known formula published in the SCIENTIFIC AMERICAN SUPPLEMENT for March 2nd, 1912. Sir Hiram's proposed apparatus should, of course, yield correct results; but since these can be accurately foretold by computation, the suggested research would at best merely verify a well-established and very reliable theorem in mechanics.

Every engineering student learns how to find the moment of inertia of a body, say of a propeller with reference to its axis. Multiplying this quantity by the speed of rotation times the speed of deviation of axial direction gives the required gyroscopic torque. Thus, starting with a familiar physical quantity, the required torque is found by simple arithmetic.

But, though the computation is so easy, the amateur may very well engage for a few moments some competent person to teach him to perform it correctly. After that he can figure the gyroscopic force of his rotating parts with entire satisfaction, and make a clear estimate of its disturbing effect.

Washington, D. C. A. F. ZAHM.

Asphalt Still a Mysterious Material

By Newton Forest

NOT long since, while walking along one of the streets of the National Capital, I came to a section which had been torn up and was being repaved with nice new asphalt. As the workmen with their huge-soled shoes scurried about smoothing out the hot, smoking stuff preparatory to the steam-roller's finishing touches, the thought came, "What a marvelous material this is!" and I stopped to watch the process. Then I began to search my brain for what I knew about this mysterious material now so generally used. It was soon discovered that I knew little of its history and less about just what it is, so I straightway started a "course in asphalt." There are hundreds of thousands of people who each day pass across streets being paved with asphalt, and like I have done many times, give no more thought to the matter other than the street is being paved, and there is a sign standing in it bearing these words of warning: "DANGER! Look Out for the Steam Roller."

Asphalt as a solid bitumen has lots of history relating to it. The word *bitumen* may be defined as a generic term for a class of minerals, occurring in nature, which are soluble in chloroform and other neutral liquids. They all consist of compounds of carbon and hydrogen, but often contain compounds of nitrogen, sulphur and oxygen also, and in the solid form iron and alumina. While bitumen may be gaseous, liquid or solid, and relatively pure or mixed with solid materials to form rocks, all asphalts belong to the solid forms. The process by which bitumens are formed in nature is still unsettled by geologists or chemists, but that organic matter enters into the process is generally admitted, but how, is a technical problem yet unsolved.

Asphalt was used by the ancients, but not for street paving. Who first suggested asphalt as paving material is not definitely known. In the valley of the Rhone, in Trinidad, and in California, it had been observed that fragments of the bitumen that were jolted from carts were crushed and compacted into a solid rock bed by the wheels of the carts that followed, and the conviction that roadbeds could be constructed of the same material was inevitable. Some time about 1840 attempts were made to pave a street in Paris with asphalt mixed with quartz, and upon a bed of sandstone, but the experiment proved a failure, due to the preparation and in the method of laying it and in the combination selected. Not being discouraged, however, the deduction being drawn that the defect arose not in the asphalt itself, experiments were continued in Paris until a satisfactory mixture was discovered, after which asphalts became known in London and many other European cities. The first asphalt street laid in the United States is claimed by Newark, New Jersey. This was in 1870, and the material came from the lake in Trinidad.

During Bible times and the pre-Christian era in general, asphalt was used almost altogether as a cement, and with very little alteration from the form in which nature supplied it. The ancients used it in the remarkable preservative methods that have brought down to us so curiously intact the embalmed dead of Egypt. Asphalt was used in the construction of the palaces of Nineveh and Babylon, and even in the Tower of Babel it played an important part. The advantages of bitumen appear to have been entirely neglected or forgotten during the Middle Ages, and the substance

(Concluded on page 468.)

Mining asphalt at Trinidad, which means simply the picking up of the material and loading it in cars. The supply is never exhausted, the deposit renewing itself by natural pressure from below as fast as it is removed.

Asphalt Lake at Trinidad, whose bottom has never actually been reached, although believed to be something over one hundred feet below the surface. Method of loosening up the material for loading in cars for transport to nearby wharf.

The Industrial Daredevil

By P. Harvey Middleton

THE tall building has brought with it the need of a peculiar type of human being—a man who, perched on some flimsy seat five hundred feet in the air, can survey the pavement below with the same equanimity as if he were standing in a first-story window. He is the man who not only builds the skyscraper, but who paints its flagstaff when it is finished, and washes its windows.

Whenever it becomes necessary to touch up the pinnacle of some dome which glitters a few hundred feet from the sidewalk, or to paint with a new coat a flagstaff which seems no larger than a toothpick to the man on the sidewalk, the newspapers invariably devote a column of space to the fearless man who accomplishes the feat. The Metropolitan Tower, which ranks as next to the tallest building of the world, gives ample opportunity for such outbursts of enthusiasm. Its lantern and ball must be touched up now and then, regardless of the fact that it is seven hundred and fifty feet from the sidewalk. Below the lantern is a balcony. To glide up from it to the lantern is a task calculated to strike terror to the heart of the average human being. The last man who performed the task of regilding the globe on top of the lantern outdid anything that had ever been attempted before. The superintendent of the Metropolitan Tower stood aghast when he saw the man Merrill calmly perched on the shoulders of a helper who was, in turn, carried on the shoulders of another, just as if the three were performing feats on the comfortable carpet of a vaudeville stage—this seven hundred-odd feet in the air, with a stiff breeze blowing!

A steeple jack who paints gilded balls at dizzy heights is only one of the many thousands of industrial daredevils. Merrill is just one of many thousands of the industrial daredevils who daily risk their lives in helping to build or to maintain the mighty structures going up into the air or down into the earth of New York city, where new buildings are being constructed at the rate of $225,000,000 annually. Tunnels in connection with the traction facilities of the city that are already constructed, almost completed, and officially agreed upon, amount to $223,267,572. To this can be added $194,250,000 for river tunnels connecting outside passenger traffic with the city's traction lines, to say nothing of the fact that New York has $140,000,000 invested in forty-five bridges over navigable streams.

Go up some day—if you have the nerve—through the many floors of some giant building in course of erection, and watch the groups of brawny iron workers unconcernedly munching their luncheons hundreds of feet in the air, a-straddle of naked beams. When the mid-day meal is over, these aerial workers still have some time on their hands, and as it is far too much trouble to go all the way down to the street, crap shooting is indulged in along the great iron girders—for it is much too windy to play cards! A good deal of money changes hands in these mid-air games, for these men who risk life and limb for five dollars a day, are gamblers almost to a man.

It used to be said that every floor of a skyscraper cost a life, but it is not quite so bad as that nowadays. Yet out of three thousand men engaged in structural work, six hundred and thirteen were either killed or injured in four and a half years. Occasionally you will look up and see a man sitting astride a cornice bracket sticking out from the twenty-fifth floor of a new building. It looks extremely perilous, but accidents seldom happen that way. More mishaps result from the slipping of a wrench than from any other cause. A man is compelled to use his wrench to pry a heavy column or girder. He puts his whole weight against it, it slips, and down he goes to his death.

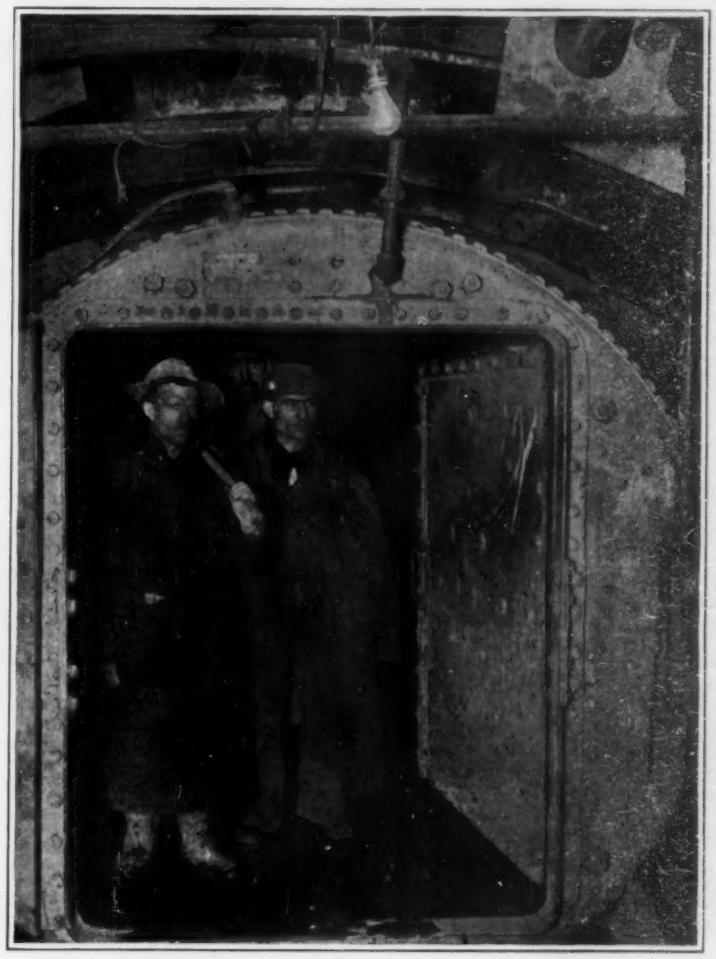
Another variety of everyday hero is the "sand hog," who digs the great tunnels under our rivers. He works ahead of the shield, drilling and blasting the rock, throwing the gravel and sand from within the cutting edge of the shield through the doors to the car, and wheels the loaded cars away from the "head." He works in three-hour shifts under an artificial air pressure of thirty pounds. He is afflicted with a peculiar disease known as "the bends." No man knows in advance when he will be struck down by this dread disease, and the men gamble freely on whose turn will come next.

That we have made some progress in protecting our workmen, however, is evident by the fact that in the building of New York's very latest river crossing, Manhattan Bridge, only five men were killed. Two of this number, both riveters, fell into the river, one hundred and fifty-five feet below. Two others fell on shore—one hundred and twenty-five feet to the street.

The International Federation of Expositions

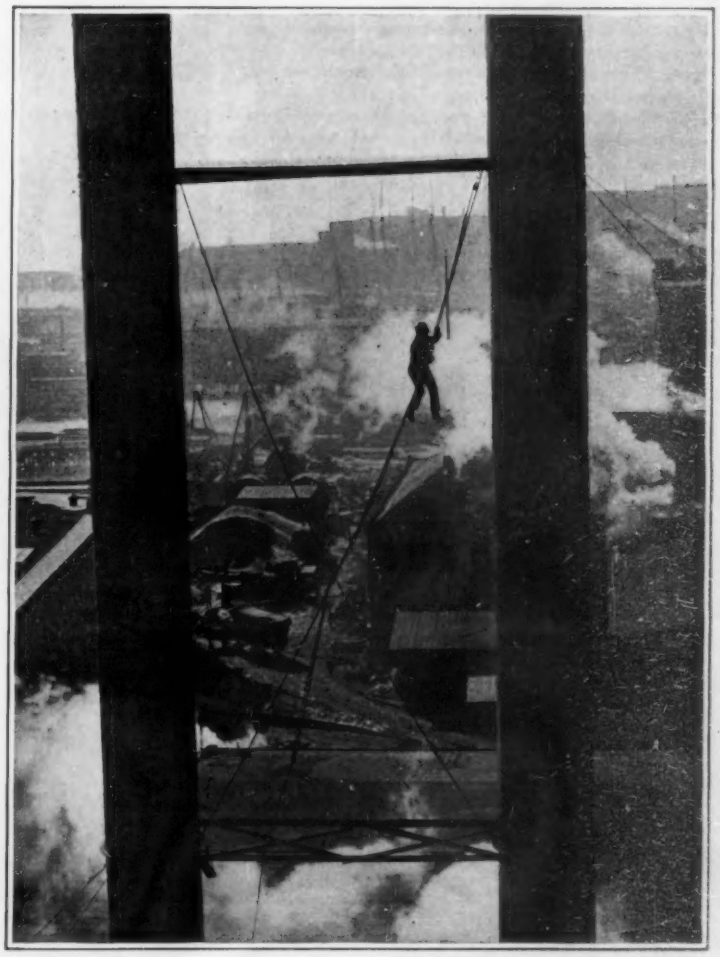
A CONGRESS of a diplomatic character representing no less than twenty-six governments was held on October 7th, at Berlin. It was organized by the International Federation of Exposition Committees, and the congress was occupied with establishing a basis for holding expositions in various countries, and it also took measures to draw up rules for the awarding of prizes on such occasions. In this way all such questions are likely to be settled in a satisfactory manner owing to an international agreement upon exposition matters.

Painting the suspenders of the Brooklyn Bridge.



Sandhogs emerging from an air lock.

One of the numerous perils of bridge building.



Steeplejack crawling up between two large smokestacks on a power house.

Photographs copyrighted 1912 by Underwood & Underwood

THE INDUSTRIAL DAREDEVIL

The Heavens in December

Three Comets Now Visible; Directions for Finding the Planet Neptune

By Henry Norris Russell, Ph.D.

THREE comets are now visible in various parts of the heavens, but only with telescopic aid. Gale's comet is still in view in the northern sky, though being in almost the same right ascension as the Sun, it can only be seen just after dark or before dawn. Schaumasse's comet, discovered at Nice last month, has moved very rapidly southward, but is still accessible to observers on the other side of the equator; and a third comet, discovered by Borrelly at Marseilles on November 2d, is visible in the evening sky, its position on December 1st being roughly in 20 hours 10 minutes R. A. and 1 degree north declination (which puts it not far from Theta Aquilæ), while its daily motion is about 1½ degrees toward the southeast. Early in November it was visible in an opera glass, but it is receding from the Earth and Sun and growing fainter.

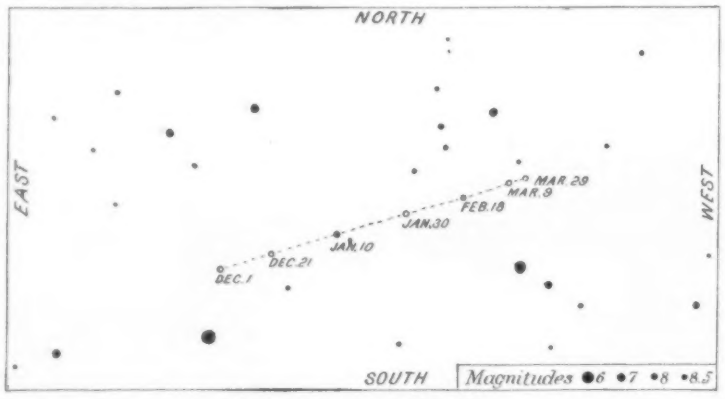
It is to be regretted that more specific instructions for finding this and other comets cannot be given in such articles as the present. The reason for this is that the ephemerides, or predictions of a comet's motion, which are published shortly after its discovery, are purposely made to cover an interval of only a couple of weeks, after which a more accurate calculation of the orbit is made, and a new ephemeris prepared for another month or so, and so on. When these ephemerides appear in foreign publications, they will often have more than half run out before they reach American readers. Except for objects of special interest (such as Halley's comet) the average astronomer has usually at his disposal only predictions that run on for a fortnight or so; and hence articles like the present, which must go to press nearly six weeks before the end of the month with which they deal, cannot give all the information that their writer might wish, for the labor of calculating the comet's motion for this especial purpose would be prohibitive.

These three comets have come almost simultaneously, after a long barren interval, Gale's comet passing perihelion on October 5th, Borrelly's on the 20th, and Schaumasse's on the 25th. All three are now growing fainter, and none of them will be conspicuous.

Schaumasse's comet is, however, of a good deal of interest, for as soon as its orbit was roughly computed it was seen that it was moving in a path very similar to that of a well-known periodic comet—Tuttle's—which last appeared in 1899. But, according to the orbit then computed this comet was not due to return until January, 1914. Fayet, a colleague of the discoverer of the comet on its present return, has however made a preliminary calculation of the motion of Tuttle's comet since 1899, and has found that toward the end of 1900 it passed within 70 million miles of Jupiter, whose attraction considerably modified its period, and accelerated its return by three months.

According to these calculations the comet should have returned to perihelion on October 9th, while Schaumasse's comet was there on October 25th. Only the most important part of the long calculations has yet been performed, and it is very probable that when the action of Jupiter has been more precisely computed, the observed and calculated times of the comet's return will agree exactly.

This comet is of interest on account of its period—13½ years—intermediate between the numerous group with periods varying from five to seven years and the longer periods like that of Halley's comet, and also because of the high inclination of its orbit plane—54½ degrees. Its least distance from the Sun is 95,000,000 miles, and its greatest 970,000,000—rather more than that of Saturn. Its orbit passes within about 7,000,000 miles of that of the Earth, near the point of the latter occupied by us on December 21st. If it had not been influenced by Jupiter, but had returned to perihelion in January, it would have passed very near us, and been a conspicuous object for a few days. As things actually were, its least distance from us was about 100 million miles.

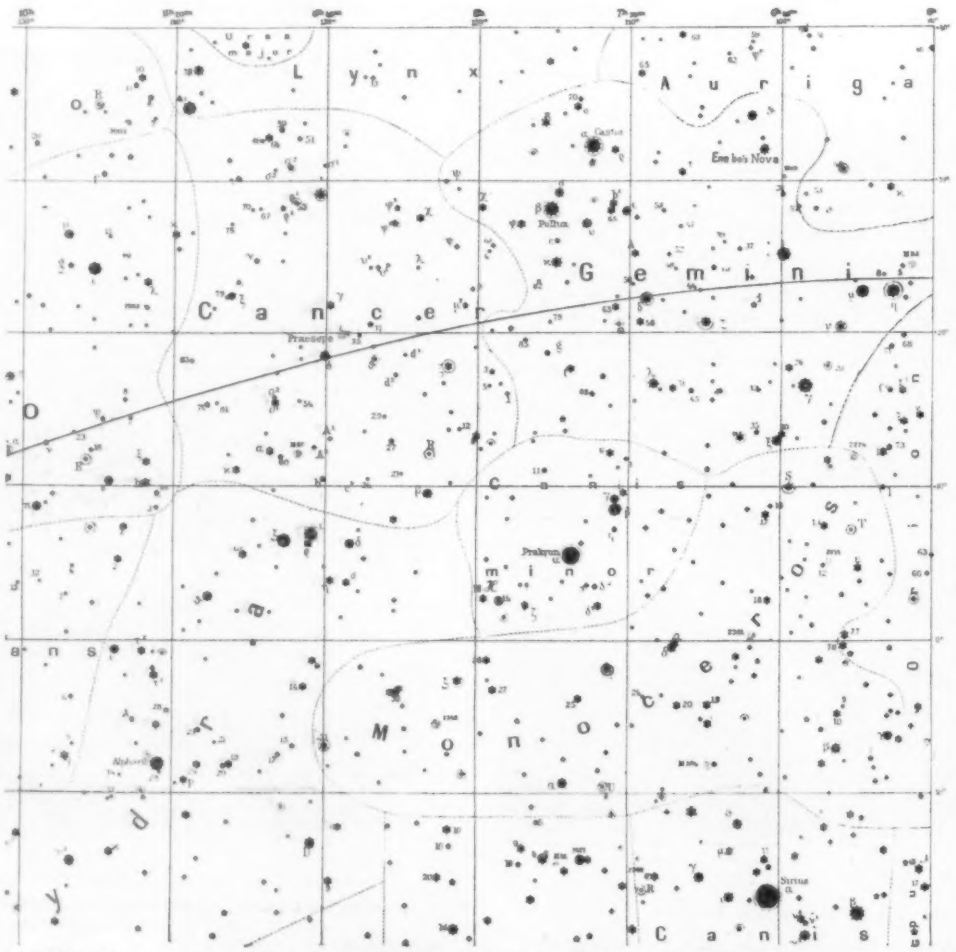


Path of Neptune, 1912-1913.

In response to several inquiries we give this month a diagram for the purpose of enabling observers who possess small telescopes to find the planet Neptune. Though Neptune does not come into opposition until January, he is so far north that he is well observable in the latter part of the evening all through December.

The annexed figure shows the region near the planet's path, covering an area 2 degrees by 3 degrees 40 minutes, and including all stars brighter than the ninth magnitude; that is, all those more than one third as bright as the planet, whose stellar magnitude at opposition is 7.7. Observers with an astronomical, or inverting, eyepiece should remember to turn the diagram upside down before using it. To aid in the identification of the region, the detailed star-map, which includes the constellation Gemini, has been reprinted this month. On this, due south of the bright star Pollux, and just below the line of the ecliptic, will be noted the star 79 Geminorum. This, and the somewhat brighter star to the eastward, equally far south of the ecliptic, are the two brightest stars shown on the large-scale map, a little below the path of Neptune. With their aid the planet may easily be found.

A good field-glass should show the planet, though as a pretty faint speck, similar in brightness to the stars marked as of the eighth magnitude on the chart. With a telescope of two or three inches aperture, the peculiar greenish color of the planet may be recognized. At least four inches of aperture, and a trained eye, too, will be needed to recognize any sensible disk.



THE HEAVENS IN THE REGION OF CANCER AND GEMINI

The Heavens.

The winter constellations are so familiar as to need no prolonged description. Taurus, Orion and Canis Major are resplendent in the southeast, and Gemini and Canis Minor in the east. Leo is rising, and so is the head of Hydra. Ursa Major is low in the northeast, and Draco in the north. Cassiopeia and Cepheus are well up in the northwest, and Cygnus is setting below them. Pegasus, Aries and Pisces are in the west, Cetus and Eridanus in the southwest, and Perseus and Auriga are right overhead. Before leaving this subject, we may call the attention of those who observe Neptune to a number of fine double stars in the same region of the sky: α Geminorum (Castor) is a splendid pair of about 5 seconds separation. κ Geminorum has a companion of 8.5 seconds at a distance of 6.6 seconds, and δ Geminorum one of 8 seconds at a distance of 7 seconds. Both of these are fine objects for a 3-inch telescope. ζ Cancri is a well-known triple. The closer pair, separated by only 1 second, can be resolved only by instruments of 5-inch aperture or more; but the companion 5.5 seconds from this system is separable by small instruments.

The Planets.

Mercury is evening star at the beginning of the month, but is too near the Sun to be easily seen. On the 8th he passes through conjunction with the Sun and becomes a morning star. Toward the end of December he is fairly easy to see, rising an hour and a half earlier than the Sun.

Venus is evening star, and is growing brighter and more conspicuous all the time as she comes farther north. By the end of the year she is almost 45 degrees from the Sun, and sets a little after 8 P. M.

Mars is just past conjunction with the Sun, and is hardly observable, as he rises only an hour before sunrise.

Jupiter is in conjunction with the Sun on the 18th, and is invisible this month.

Saturn is in Taurus, just

(Continued on page 469.)

A Freak Guide Post

AT Bromley (Kent, England) there has just been erected a post for the guidance of travelers which is certainly unique. It gives directions to such distant points as John o'Groats and Land's End, while one finger indicates the way to Paris. On the top of the post is a model of a biplane, while on the three principal arms are fixed replicas in miniature of a racing motor car, a motor cycle, and a monoplane.

Wreck of the Submarine "F-1"

IN the SCIENTIFIC AMERICAN of October 12th, note was made of the new depth record for submarines established by the boat "F-1," in San Francisco Bay on September 5th. The boat went to a depth of 283 feet. One of the readers of the SCIENTIFIC AMERICAN living in California has sent us a photograph of the wreck of this submarine at Port Watsonville, Monterey Bay, on Friday, October 11th. The wreck resulted from the breaking of her moorings during a heavy sea. Two sailors were carried overboard by a big wave as the boat struck, and lost their lives. The submarine lay on the beach for eight days, but was finally floated again on October 19th, by the combined efforts of the cruiser "Maryland" and the tug "Iroquois." The hull was not damaged, but the engines were practically ruined. The photograph shows the wreck as it appeared at low tide.

Giant Forest Hogs of Africa

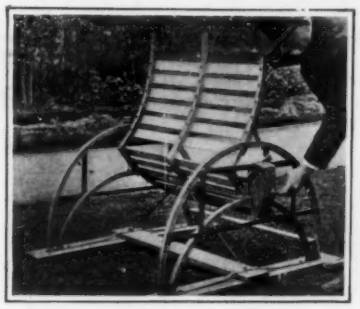
ABOUT the time of the discovery of the okapi, the natives of the Equatorial and Central African forests reported the existence of a large, pig-like animal which they had seen and gave thrilling accounts of the size and ferocity of this unknown beast. Owing to the habit of this creature of roaming only in the almost impenetrable forests and jungles, few white men and explorers have been able to penetrate far into their haunts and kill one. The first specimens to reach America have just been received from Africa and mounted at the Museum of Natural History, New York. The accompanying photograph shows the realistic appearance of these remarkable new comers. They are distinct from the wart hog, Red River hog and bush pig, and considerably larger, standing three feet high and six feet long. Natives report that they attain the size and height of a zebra and a rhinoceros. They are found only in the dense and remote equatorial forests of British East Africa. They are strictly a forest-living animal and seldom come out into the open. To capture or shoot one is very dangerous or difficult. Owing to the thick forest they must be hunted at close range, and they are apt to charge their enemy. The most conspicuous feature of these beasts is their grotesque and formidable head, equipped with huge curved tusks. Below the eyes of the monster is a pair of warty growths, like the fungi which commonly grow on trunks of decaying trees. Their bodies are covered with long, jet black bristles. The giant hogs are supplied with dangerous teeth and tusks, and they prey upon various animal inhabitants of the forests. They are said savagely to attack native women who are compelled to frequent the interior forests to gather faggots for fire wood. Some of the pigmy tribes of the interior, according to reports of the natives, capture these animals in pitfalls, after which they kill the beasts by shooting them with poisoned arrows. The scientific name of the giant hogs—"*Hylochærus meinertzhageni*"—is fully as dreadful as the animals themselves.

Motorists' Bridges for Their Exclusive Use

BRIDGES built like car tracks have been installed by the motorists of Southern California to cross streams which are unprovided with regular bridges. While it was possible for teams to ford the streams the heavy machines would sink in the sand, and, therefore, the Automobile Club raised the money to install this unique type of bridge. As there is no roadway between the channels in which the wheels run, no horse-drawn vehicle can make use of the bridges; and this is just, in as much as the motorists paid the entire cost. Although the construction is light and inexpensive, yet it solves the problem very nicely.

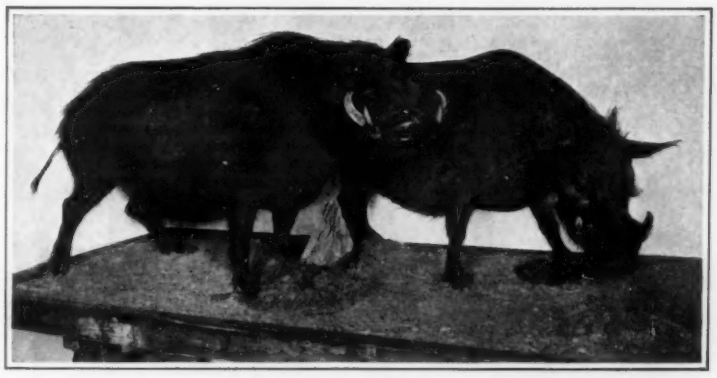
Readers are invited to contribute photographs of novel and curious objects, unique occurrences and ingenious contrivances. Such as are found available will be paid for promptly.

A curious guide post.

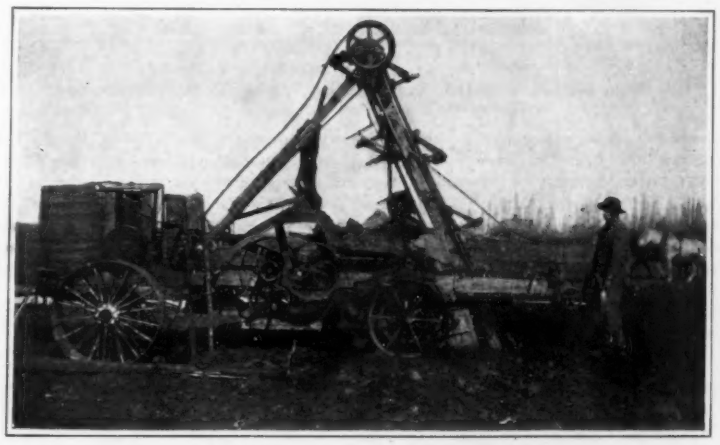


Nickel in the slot bench.

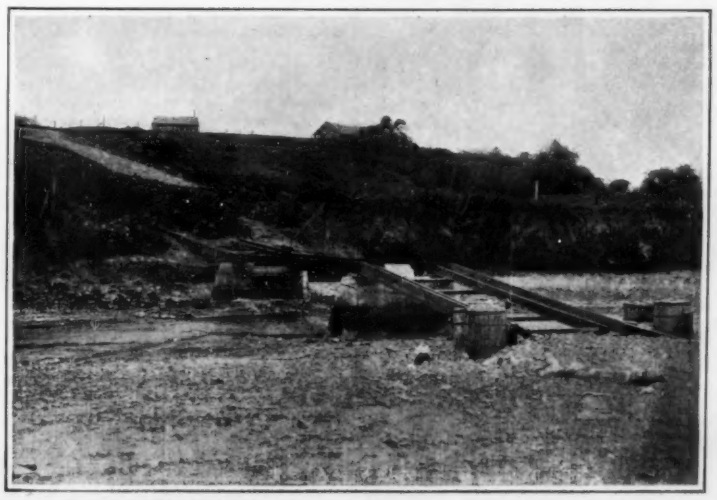
Wreck of the submarine "F-1" in Monterey Bay.



African forest hogs just acquired by the American Museum of Natural History.



Home-made gasoline ditcher.



Bridge built for the exclusive use of automobiles.

A Nickel-in-the-slot Bench

DROP a nickel in the slot and get a reserved seat for two; that is the idea of the new park bench in use in San José, California. The plan of the inventor is to place his bench in public resorts, parks, etc., not to do away with the free benches, but in addition to them. This will take care of the unusual Sunday and holiday crowds, who cannot find accommodation, and it will also appeal to people who wish an exclusive seat and do not care to rub elbows with strangers. Many people would gladly pay a nickel for this privilege, and the inventor expects to make enough on each bench to add to the revenues of the Park Commission, and pay him a modest profit besides.

As the photograph shows, the bench is so adjusted that it cannot be used until a coin is dropped in the box at the side. This releases a lock and the bench can be swung back, making a reclining or rocking seat if desired. It is also equipped with an awning, not shown in this picture. When vacated, the bench resumes its former position automatically, and locks, ready for the next patron.

A Home-made Gasoline Ditcher

THE accompanying illustration shows a novel home-made gasoline ditcher constructed at Fulda by a Minnesota farmer. The machine may be seen at work cutting a ditch one foot wide and six feet deep. The machine will dig to a depth of about 12 feet. Only one man is required to operate it. A 15 horsepower engine is used, supplying power to dig 8 to 12 rods per hour, depending upon the depth of ditch and soil. The grade of the ditch is obtained by a line stretched tight, and the gage rod from the main beam is kept on top of the cord.

Wild Honey in South Africa

MR. E. N. MARAIS has published in a South African agricultural journal a number of curious facts concerning the wild honey of the northern Transvaal. Two distinct kinds of honey are recognized, viz., the ordinary golden-yellow honey, common to all parts of the world, and a snowy white kind, known to the Boers as "sheep-tail fat honey." The latter is described as beautiful in appearance and of most delicious flavor; it is also reputed to possess valuable therapeutic qualities. When expressed from the comb it almost immediately assumes the consistency of vaseline. Its special qualities are said to be due to the fact that the bees extract it only from certain grasses. The hives are usually in hollow trees; sometimes in ant-bear holes or ant-hills.

Gathering wild honey appears to be a favorite pursuit of the Transvaal native, and one that has some peculiar features. The bee-hunters wear no protective clothing, but appear to be so thoroughly inoculated with formic acid as to be immune to its effects.

The favorite honey is produced by a stingless bee, called the "moka," of which there are two species. The larger of these builds only in the ground and in very hard soil. The hive is found at the bottom of a shaft having the diameter of a lead pencil, and from two to five feet deep. The honey is not stored in the comb, but in wax bags, each about as large as a good-sized thimble; these are cemented together with wax, forming a cluster about the size of an orange. A hive may contain from a few spoonfuls to two gallons of honey.

Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

Some Old Key Rings

MANY interesting things are found among expired patents, especially when we touch upon an article in universal use. This is the case with key rings. Nearly every one carries a bunch of keys on a ring of some form. Possibly the form most generally used is the ordinary split ring in which several convolutions are lapped side by side. In the patented art we find many forms, some of which we show in the accompanying engravings. *A* is a key ring, probably devised by a musician, since it takes the general form of the clef, and in this ring the crossed wires and the middle ball bear upon the adjacent wires with sufficient force to hold a key when inserted as shown.

In *B* is shown a key ring of a novel form with a swinging latch which may be sprung over the end of the opened member to hold the ring closed.

C presents a form employing a linked chain and a fastening block for locking the chain closed.

D shows a form in which a flexible cable of braided wire is held at one end to a yoke, and is detachable at its other end so that it may be coupled up and uncoupled as desired.

E presents a triangular form with a sliding sleeve on one end, which may cross the gap or opening for the insertion and removal of the keys, and this sleeve has a tongue operating in a key way in the wire.

The ring *F* has a swinging bridge which can close the gap between the ends of the ring.

The ring *G* is made of two semi-circular sections hinged together at one end and springing into interlocked engagement at their other ends.

The ring *H* is of a special form, and has its separable ends formed one with a recess and the other with a tongue to spring into and out of the recess in connecting and disconnecting the ends of the ring.

The ring shown at *I* will be recalled by many. When the revolving U-shaped part is in one position, the key may be inserted in the opening of such part and then turned to the position in which said opening faces the interior of the ring. Thus the keys can be easily placed in and removed from the ring.

J is a key holder without being a key ring, as in this construction a holding device is passed through the eyes of the keys so that they can turn independently upon the holder to bring any selected key into position for use.

The ring *K* shows an interesting construction adapted for use as a key ring, and in which an open link has one of its ends threaded and a sleeve is threaded on such end so that it can be adjusted across the gap between the spaced apart ends to close the ring.

All of the foregoing key rings are shown in expired patents. Some of the forms have been popular in some sections of the country; doubtless all have been used to a greater or less extent and they serve to illustrate the exercise of considerable ingenuity in the production of simple devices.

Some old key rings that have been the product of expired patents.

An Electric Safety Lamp for Miners

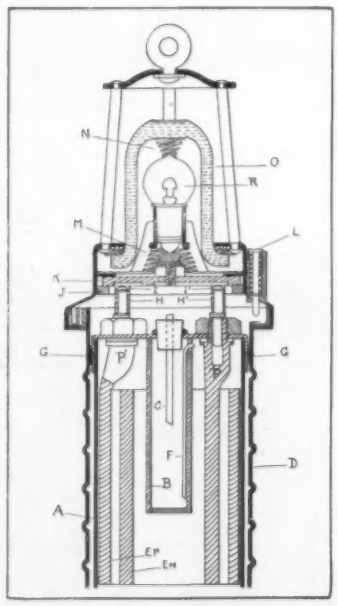
By Robert G. Skerrett

THE British government set an example some while ago when it offered a prize of $3,000 for an acceptable electric safety lamp for miners. A German engineer of the name of F. Faerber of Dortmund was the successful competitor. In Europe, the annual loss of life due to mine explosions averages about one in every thousand operatives, while the yearly toll here is from four to five times as great.

The electric lamp is outwardly very similar to the benzine safety lamp, which is extensively employed in mines abroad, but there the similarity ceases. The benzine lamp is not absolutely proof against the menace of fire damp, while the "Cage" lamp is. The electric lamp is of 1.5 candle-power—having twice the illuminating value of its benzine rival—and is cheaper to maintain, costing but 1.25 cents per shift. The capacity of the storage battery is extremely high, and for a lamp of 1.5 candle-power there is electric energy enough for an endurance of sixteen hours, or two shifts.

The Cage lamp consists primarily of an upper section holding the incandescent light and a lower one in which is housed the storage battery. The accumulator is of circular cross-section sealed inside of a celluloid casing. The form adopted for the battery elements is one calculated to withstand the rough treatment unavoidably incident to mining. Heretofore the elements have been in plates which had to be handled far too carefully to make their employment in a lamp of this sort practicable. By making use of cylindrical elements, Faerber not only obtains the desired rigidity, but he obviates the warping common to ordinary plates when they are overcharged or when too much discharged. Because of this characteristic, it is possible to charge the present battery to an exceptionally high capacity. This explains the endurance which is obtained.

A miner's electrical safety lamp that won a prize of $3,000.



Longitudinal section through the lamp.

In order to remove an exhausted cell, it is necessary only to cut through with a knife a band of celluloid paper which forms a seal. A new accumulator can be put in place in a very few moments without damaging the outer casing of celluloid which constitutes the housing for the cell. A new strip of this paper completes the installation again. Of course, it is very necessary that the lamp should not open inopportunely. To prevent this, a lock working upon the bayonet principle is provided, which is quite effective, having been previously thoroughly tested out in the old benzine safety lamps in service. To turn the current on or off, it is necessary only to rotate the top of the lamp through a small angle. By this means a contact is made and broken with connections rising from the bus-bars of the positive and negative elements.

The gases formed within the lamp are permitted to escape from the cell by following down a small tube *F*, which is contained within the cylinder *B*, and thence passing outward to the atmosphere by way of tube *C*. The arrangement is ingenious, and, as will be seen, effectually prevents the escape of the electrolyte should the lamp be upset or laid upon its side.

To guard the incandescent light from shock, it is virtually suspended or held in place between two opposing spiral springs. This installation is then inclosed within a thick glass cover. Metal stanchions and a rigid top further shield the glass from the accidents of ordinary service.

The general outward form of the lamp is free from any troublesome projections that might catch in the miner's dress or be easily knocked off by contact with surrounding objects. The exterior casing is of heavy corrugated tin drawn from a single piece, and, therefore, quite capable of standing pretty rough usage. The inventor has been continually mindful of the rather heedless character of the miner and of the rugged nature of the work expected of him, and the Cage lamp reflects this consideration in every department of its get-up. These lamps are already extensively employed in mines, both in the British Isles and in Germany, and it is said that they have given the utmost satisfaction in every particular.

Automatic Car Coupler

THERE has long been a demand for a car coupler that is absolutely automatic. To be sure, there are automatic couplers now in use, but it frequently happens that the couplers have to be alined manually to bring them in proper registration for automatic coupling. Difficulty has also been experienced in the operation of these couplers when one of the knuckles is in open position. Recently an inventor who hails from Strasburg, Virginia, has devised a car coupler in which the members are brought into mutual co-

operation or interlocking engagement even when both knuckles are closed at the time they approach each other. The design of this coupler is similar to that of the Janney type, but it has in addition a spring pressed plunger which renders the coupling automatic, and serves to retain the parts in locked condition when the cars are rounding a curve. The knuckles are also of hooked form and rounded inwardly, so as to guide the corresponding knuckle of the other member into engagement therewith. In a test of this coupler, it was found that it would operate when the cars were very gently shoved together, and that it would act either on a curve or on a straight line. It was also proved that it would pick up a runaway car, it only being necessary for the locomotive to follow at a greater speed than the runaway. The new coupler will operate satisfactorily with any of the standard types.

Notes for Inventors

Ozone as a Water Purifier.—In many European cities ozone works have been erected for sterilizing the drinking water and it is reported that satisfactory results are being obtained. Typhoid, cholera and dysentery bacteria are claimed to be destroyed by the ozonization process, and as the process may be used on a small scale, portable apparatus adapted for domestic use may offer a field for useful invention.

Cooling an Engine Independently of the Engine Speed.—In patent, No. 1,043,344, Yorgen Newman of Monroe, Utah, presents in connection with an internal combustion engine, a thermostatic device exposed to the heat of the engine, a fan driven by the engine to cool it and means to regulate the speed of the fan independently of the engine speed and including a connection between the regulating means and the thermostatic device, so that the speed of the fan will be varied independently of the speed of the engine and in correspondence with the temperature of the engine.

Life Preserver Within Bathing Suit.—John F. Burke of Philadelphia has obtained a patent, No. 1,041,012, in which is shown a bathing suit with a body garment within the bathing suit, comprising buoyant body portions and leg portions that are flexibly connected so that they will be held in place without the connections interfering with the movements of the wearer.

Walking Head Down.—A theatrical apparatus has been patented to John W. Frakes of Chicago, Ill., No. 1,040,303, in which a series of vacuum cups open at their bottoms are arranged in a row and controllable means are provided for exhausting air from the said cups and for admitting air to them, and the performer has plates secured to her feet and adapted to operate as closures for the cups, so that by properly manipulating the controlling devices the performer can walk head down along the row of cups.

An Improved Educational Device.—A patent has been granted for an educational device which includes a ring-like passageway and cross passageways within the ring and communicating at their ends with it, so that double faced buttons carrying letters or other characters may be shifted along the ring and thence into proper relation with the cross passages to spell words or for other purposes. The patent, No. 1,041,059, is issued to John H. Fox of Berea, Ohio.

A Westinghouse Company Electrical Distribution Patent.—Paul M. Lincoln, of Pittsburgh, assignor to Westinghouse Electric and Manufacturing Company, has patented, No. 1,039,767, a system of electrical distribution in which there is provided a number of line sections with means for supplying energy of different character to the respective sections. Normally deenergized intervening sections are arranged with respect to the energized sections and means are supplied for connecting the intervening sections to one or the other of the adjacent energized sections so that the vehicle may pass from the intervening deenergized sections.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Of Interest to Farmers.

CHICKEN FEED TROUGH.—G. H. LEE, 1115 Harney St., Omaha, Neb. The invention provides a trough for fowl and prevents them from scratching or wasting the feed; provides a trough guard which may be quickly adjusted therein after feed has been deposited to in this manner avoid interference with the loading of the trough; provides a trough and guard which coöperate to hold the guard in position; and provides a trough which facilitates the cleaning and sanitation of the same.

Of General Interest.

PROCESS OF TREATING THE CANDELILLA-PLANT FOR THE RECOVERY OF WAX.—W. S. WATSON, Lock Box 1, Butler, Pa. An object here is to provide a process for treating the candelilla-plant in order to recover the wax and to leave the plant in such condition that it may be subsequently used for food. The invention provides a process for dry heating the plant and for subsequently treating the plant by dry steam, with a final treatment by water.

VIOLIN.—G. J. JUNKER, care of Wirz Bros., Greenville, Ill. This invention refers to stringed instruments of the viol type, such as violins, 'cellos, bass viols, etc. The object is to provide a violin arranged to produce a rich and deep tone, to permit fingering of the strings, and to maintain the strings in tune for a long period without retuning.

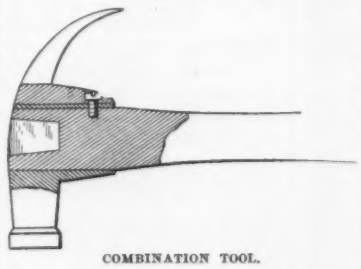
PART FOR WIGS AND THE LIKE.—M. R. RONSHKOWSKY, care of M. R. Harris, Manhattan, 801 Southern Boulevard, New York, N. Y. In this patent the invention has reference to improvements in parts for wigs and the like, and has for an object the provision of an improved weave which will not disclose the supporting canvas or backing at any point, but will only show a groove or part in the hair.

FOLDING CAMERA CASE.—S. H. PETERSON, 1325 Fifth Ave., Minneapolis, Minn. The invention in this instance relates generally to carrying cases for folding cameras and more particularly it involves a construction wherein it is not necessary to remove the camera from the case when it is desired to use the camera.

HOT WATER VESSEL.—S. W. LONGAN, 3735 Tracy Ave., Kansas City, Mo. This vessel is arranged with non-flexible flat, convex and concave surfaces, adapted to fit various parts of the human body and capable of giving off a graduated amount of heat, the vessel being arranged for use as an irrigator, by suspending the vessel and using the same as a tank connected with an irrigating tube to discharge the water under pressure onto a desired part of the body.

Hardware and Tools.

COMBINATION TOOL.—J. STAUDER, 426 Locust St., Mount Vernon, N. Y. This tool, a sectional side elevation of which is shown in the engraving, is provided with interchangeable tool members to permit of readily converting the tool into or using it as a hammer,



COMBINATION TOOL.

claw hammer, adz, hatchet and the like. Use is made of a hammer provided with an eye for engagement with a handle, the head being supplied at one side with a dovetail groove converging outwardly and an interchangeable tool member provided with a dovetail tapering tongue fitting the same groove.

HOSE REEL.—C. WAGNER, 587 Hudson St., New York, N. Y. This invention permits of conveniently moving the hose reel about, and of unreeling and stretching a desired length of hose from the water supply to the place to be sprinkled, at the same time permitting water to pass through the unreeled portion of the hose as well as the portion still wound up on the drum of the reel, and to allow of unreeling or reeling up the hose without moving the reel about.

CLASP.—F. SLOVER, Lindenhurst, L. I., N. Y. Mr. Slover's invention has for an object the provision of a means for holding parts of fabric together and in place by clamping the same so as not to injure or tear the fabric, yet to provide a means for readily unlocking the binding members of the same.

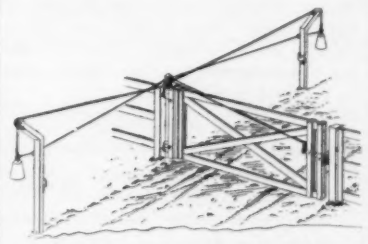
ATTACHMENT OF KNIFE BLADES TO THEIR HANDLES.—F. HOPPE, Dawson, Neb. In this invention a permanent easily manufactured fastening of double tang into the handle takes place without aid of any further means of attachment such as cement or rivets, and is effected by making the part of the handle left between the perforations for the double tang greater than the space between the double tangs at the junction with the blade, so that the tangs when forced into the handle holes are forced apart and the terminal hooks on them are driven into the material of the handle.

Machines and Mechanical Devices.

ELEVATOR GATE CLOSING DEVICE.—E. L. MURRAY, 202 N. 8th St., Council Bluffs, Iowa. This inventor provides a device for automatically closing the gates of an elevator shaft, whenever the elevator car leaves the floor in either direction, and set in operation by the elevator's movement, and so arranged that the car can not leave the floor without operating the means for closing the gate.

PIPE CUTTING MACHINE.—L. R. BLACKMORE, 9 Small Ave., Caldwell, N. J. The object here is to provide a novel construction for driving the base or supporting rollers as well as for driving the cam for directly operating the cutter. A novel means is provided for adjusting the operation of the cutter to suit the diameter of the pipe.

MEANS FOR OPERATING GATES.—C. W. WITSIL and F. O. WILLIAMS, Analomink, Pa. This road gate may be operated by the occupant of a vehicle upon approaching the gate, to cause the gate to move in a direction away from the vehicle, and whereby also when the vehicle has passed through the occupant can close the gate behind him. An object of this



MEANS FOR OPERATING GATES.

invention is to provide a gate-operating means as indicated, and in the form of attachment that may be applied to ordinary gates without any great modification in the latter. The accompanying illustration shows a perspective view of a gate equipped with the improved operating devices.

NOISELESS CASE FOR NOISY MACHINES.—J. F. O'BYRNE, Jarbidge, Nev. The essential novelty of this invention is that it removes the noisy medium, air, from around such machines as computers and typewriters by incasing them in a suitable case, having means for operating the inclosed machine from without, and by a key operated valve connect the case, when closed, to a vacuum chamber which removes the air.

VARIABLE SPEED MECHANISM.—R. M. RUCK, 44 Thurloe Square, South Kensington, London, England. For the purpose of the invention the wheels of progressively varying diameter in the respective sets are arranged to form, in effect, toothed cones whose inclinations are opposed to one another; while the relative positions of the wheels of the two sets are such that only a single pair of change wheels can be in gear with one another at a time and that progressively varying speed-ratios may be obtained by shifting the slidable set of wheels through progressively varying distances lengthwise of its shaft so as to bring successive pairs of change-wheels into operation.

Railways and Their Accessories.

EMERGENCY BRAKE SETTING DEVICE.—H. S. BEATTIE, 222 Poinsetta Place, Hollywood, Cal. This automatic device is for use in setting the brakes on trains equipped with pneumatic brakes, which will operate to set the brakes when the car is subjected to any abnormal jolts or jars, as by the wheels leaving the tracks or by the breakage of one of the wheels of one of the trucks.

CAR WHEEL SLIDE SHOE.—J. R. FLEMING, 801 Monroe Ave., Scranton, Pa. Among the principal objects in view here are: to provide a sliding means for supporting the wheels and car connected therewith; to provide a shoe to bridge across frogs or other rail junctions on which the car is mounted; and to provide means for laterally adjusting the wheels to perform their ordinary function.

FREIGHT CAR LADDER.—W. A. MITCHELL, care of M. K. & T. R. R. Co., Sedalia, Mo. An object here is to provide ladders for the ends and sides of freight cars, which are in conformity with the U. S. safety appliance law, and which possess features that render these ladders safer than the ordinary ones. Roof grab irons obviate the use of screws or bolts in the roof itself.

EMPLOYEE'S TRAIN TIME CARD.—E. J. HARDY, Caliente, Nev. Through the use of this card the movements of regular trains (passenger and freight), and extra or irregular trains are controlled without requiring a large amount of calculating work by the train dispatcher, and issuing, dispatching and repeating many worded or lengthy train orders, at the same time insuring a high degree of safety in running all trains.

METAL DOOR.—L. G. FOWLER and H. V. THOMAS, Blairstown, Mo. The invention is an improvement in metal doors, especially adapted for railroad cars, wherein the door is provided with reinforcing ribs formed by bending the material of the door upon itself, together with the particular form of truss rod.

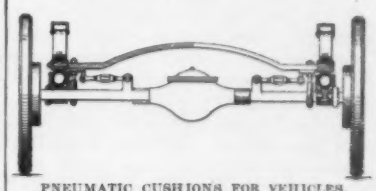
MEANS FOR VENTILATING RAILWAY AND OTHER CARRIAGES.—F. GAIN, 40 Rue de l'Arcade, Paris, France. This device for use in ventilating carriages consists of a series of vertical glass strips mounted on pivots in a frame which is mounted in the wall of the carriage, these strips being connected by a coupling rod which enables them to be displaced all together.

LUBRICATING DEVICE.—S. PLYMALE, 720 Corbett St., Portland, Ore. The principal object here is to provide a device adapted to lubricate the car wheel flanges, the device being moved into operative position by simple means within easy reach and control of a person in charge of the car as conductor or motorman.

Pertaining to Vehicles.

PNEUMATIC TIRE FOR VEHICLE WHEELS.—E. R. RIEDINGER, 84 Upper Kennington Lane, London, S. E., England. The tire comprises three concentric rims, the outer one of which carries a solid rubber tread band, while the inner rim is permanently attached to the felly of the wheel. Between the inner rim and the intermediate rim, is an air tube protected by a pair of elastic cheeks of rubber and canvas fabric. Between the intermediate rim and the outer rim are annular clamping-plates secured by transverse bolts which exert a wedging action between the rims.

PNEUMATIC CUSHION FOR VEHICLES.—J. O. DAVIS, R. F. D., No. 4, Pawnee, Okla. The object here is to eliminate as far as possible, jolting and jarring as the vehicle passes over ground obstructions, without employing expensive pneumatic tires used on automobiles and other motor driven vehicles. The inventor utilizes a cushion preferably tubular in form,



PNEUMATIC CUSHIONS FOR VEHICLES.

to take up vibration of a vehicle in motion; and he locates this cushion between the axle and the springs which support the chassis of the car. The springs used are carriage springs made up of a number of strips or leaves which are bent downward; and each spring carries midway of its length, at its lowest point, a shoe which rests upon a part of the tubular cushion. The engraving shows a transverse section of the cushions as positioned on the rear axle.

RESILIENT TIRE.—H. A. STONEHAM and C. T. SCHWARZE, 111 Sherman Place, S. Orange, N. J. This invention refers to a form of resilient tires for automobiles and other vehicles, and particularly relates to that type of resilient tires which are not intended to be inflated, and which are not only resilient, but are also reliable and durable.

TIRE RIM.—J. D. ANDERSON, care of American Trust Co., Houston, Tex. The invention relates to tire rims for automobiles and similar vehicles, and an object is to provide a rim which will be of relatively light weight, strong, and which will remain securely in place. Another object is to make a divisible rim in which each half is of the same size and strength.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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The Motor-driven Commercial Vehicle

This department is devoted to the interests of present and prospective owners of motor trucks and delivery wagons. The Editor will endeavor to answer any questions relating to mechanical features, operation and management of commercial motor vehicles.

Waste in Truck Tires

By J. M. Gilbert

FROM a constructive standpoint it is a fine industrial accomplishment so to build a solid rubber tire that it is in every way equipped to render a mileage service wholly commensurate with the dollars and cents investment of the user. On the other hand, it is quite another matter to have the structural strength and natural service-yielding qualities of the tire so conserved, through proper usage, that it will produce its full quota of mileage before being forced into premature deterioration through abuse and neglect.

In promoting an economic tire service the scope of the tire manufacturer has pronounced limitations. When once his product passes into the hands of the consumer, systematic co-operation is necessary to secure the result sought after—the greatest possible mileage at the lowest possible cost.

As a matter of fact, there is a tremendous waste in truck tires. Some of this waste is due to ignorance on the part of truck operators. However, much more of it can be traced to lax methods, shortsightedness and downright abuse. Many drivers apparently entertain the misplaced idea that solid tires require no looking after so long as they remain on the wheels and run. They seem to reason, further, that inasmuch as they are protected by the manufacturer's guarantee, the treatment they give their tires has little or no direct determining value upon their tire maintenance cost. This is an absolutely fallacious conclusion.

Mileage and Cost.

A manufacturer's guarantee of mileage, whether it be for 6,000, 8,000 or 10,000 miles, has little or no effect, ultimately, in fixing tire costs beyond establishing a maximum cost. That is to say, if a manufacturer guarantees his tires for 8,000 miles and by careful driving and the proper handling of them the owner gets 10,000 or 12,000 miles of service, he has reduced the operating expenses of his truck to the extent of the extra mileage his tires have yielded. In such cases the operator, himself, has been directly responsible for fixing a minimum of tire cost, irrespective of anything the manufacturer may have promised him in advance.

Furthermore, the manufacturer does not say to the user that his tires are guaranteed for a certain mileage regardless of the uses and abuses to which they are put. So here is another very logical reason why it is profitable to give tires the attention they deserve, not only because of their inestimable importance in truck equipment, but because they are expensive as well.

Overloaded Tires.

Truck operators who do not safeguard their tires against the common forms of abuse which shorten tire life, are bound to find their bills for up-keep far in excess of what they should be. There are a few profitable "don'ts" which should be posted conspicuously in every garage. Some of them follow:

Don't overload your tires. Bear in mind that they must sustain every ounce of weight above them. When overloaded a greater burden is imposed than the manufacturer designed them to carry. The result is they break down prematurely, disintegrate and do not yield anywhere near the mileage they are capable of.

Carrying Capacity.

The following table shows the average carrying capacity, per tire, of the various common sizes of solid tires, single and dual:

Sizes from			Single. Pounds.	Dual. Pounds.
30 x 2½	to 42 x 2½	.....	650	1,400
30 x 3	to 42 x 3	.....	950	2,500
30 x 3½	to 42 x 3½	.....	1,375	3,500
30 x 4	to 42 x 4	.....	1,750	5,000
34 x 5	to 42 x 5	.....	2,000	6,000
36 x 6	to 42 x 6	.....	3,000	8,000
36 x 7	to 42 x 7	.....	4,000	10,000

Determining the Load.

It is an easy matter to determine whether a truck is sufficiently tired to carry its load. Run it on the scales and get the total weight. Then back off the rear wheels, leaving the front wheels as near the center of the scales as possible. Record this weight and deduct it from the total. This gives you the load the rear wheels are carrying. Supposing the combined weight of the truck and load is 13,000 pounds, distributed 3,000 pounds front and 10,000 pounds rear, this truck requires four-inch single tires in front and four-inch dual tires in the rear. If the truck is not equipped up to this standard you may be sure it is under-tired and that an overload is being carried.

Care of the Tire.

Excessive speed is incalculably hard on tires. When a truck is bumped recklessly along at an immoderate pace the strain on the tires is terrific and they soon go to pieces.

Care should be exercised in stopping and starting. Sudden and violent action has a tendency to separate the tread of a tire from its base.

A truck should not be left standing over night under load. To do so imposes an unnecessary strain on the tires.

Oil is a natural enemy of rubber and tires should never be allowed to rest on a greasy garage floor.

A little sound reflection on the tire question is sure to prove a profitable investment of time for any truck operator.

Give it a trial and see if this statement isn't true.

The Motor Truck's Span of Life

By John R. Eustis

IN computing the cost of operating and maintaining motor trucks, it is customary to include depreciation as one of the items. This item varies from ten per cent or twelve per cent to as high as thirty-three per cent of the purchase price of the vehicle, the higher percentage prevailing a few years ago and the lower percentage being the rule now-a-days. In other words the life of the motor truck is estimated at from three to ten years.

Depreciation Charges.

The practice of including depreciation among the items of expense is undoubtedly a continuance of a similar practice in connection with horses, for it must be understood that most of the motor trucks used are doing work formerly done by horses and in the service of the same owners. Many years of experience with workhorses taught the obvious lesson that a horse costs so much in the beginning, so much each year for feed, shoeing, veterinary service, etc., and at the end of a certain period of time, dies, then becoming a total loss, except for the few dollars its hide will bring. The United States Department of Agriculture has compiled and published statistics which prove that the average working life of a horse in this country is five years, and in the larger cities a little more than four years. It is, therefore, entirely justifiable to allow from twenty to twenty-five per cent on the purchase price of a horse each year under the head of depreciation.

In continuing this practice when motor trucks are substituted for horses, an injustice is done to the former. This injustice lies not in the fact that the depreciation charge each year increases the yearly cost of operating and maintaining motor trucks, for the latter have been able to show satisfactory economy, even where the depreciation charge was high, but in that it sets the limit of a motor truck's life at a few years.

Horses Cannot be Repaired.

Under the customary methods of computing the cost of operating and maintaining motor trucks, all repairs and replacements are also charged. Under these two heads, the expense of keeping motor trucks in good running condition is provided for, and if all necessary replacements have been made, then at the end of a number of years of service the owner has a vehicle capable of doing the same work that it did when new; yet it might be that at the end of ten, twenty or thirty years, not one part which was in the original vehicle remains. This, then, is the real difference between horses and motor truck as far as their span of life is concerned, and it would seem not altogether incorrect to say that the motor truck's span of life is everlasting.

The proof of the pudding is of course in the eating, and the life of a motor truck can best be estimated from actual experience. Unfortunately, however, the commercial motor vehicle is of such recent origin that a number of years must elapse before the theory in this case can be substantiated by actual practice. There are, however, a number of motor trucks of various types which have been in constant service in this country for from five to ten years, and most of them can do as much work to-day as when new. Furthermore, the present day vehicles are vastly superior to those manufactured between 1902 and 1907.

A Department Store Experience.

A large department store in London is operating twenty-two motor vehicles, which have traveled a total of 1,110,000 miles, or an average of 50,000 miles for each vehicle. One of these vehicles has averaged close to 12,000 miles per year for eight years, and its owners state that it is giving just as good service to-day as it did at the beginning. If there is a limit to the life of a motor truck, it has not as yet been determined.

Motor Truck Queries and Answers

A. W. R. writes: I have noted statements to the effect that the block tire for motor trucks, because each block is surrounded by air, keeps much cooler in service than the continuous solid tire. I will appreciate any information on this matter that you can give me.

A. While we have no exact data on the block tire, we know that under exceedingly heavy loads they give a better performance than the continuous tires; for instance, in coal trucks and the like. Theoretically the block tire does not generate the heat that the continuous tire does because it has more radiating surface, and because the rubber has an opportunity to displace more easily. Furthermore, in blocks there is no accumulated wave, such as there necessarily is in an endless tire, the lack of which wave cuts out strain at the base of the tire, and also increases the mileage, as the weakest part of the solid tire is the joint between the base and the tread rubber.

M. P. S. writes: Is the steam motor truck a possible factor in this country, and is it not the logical type for very heavy work?

A. Outside of the British Isles the steam truck is hardly known to-day, and there it is giving way to the gasoline vehicle. As for heavy work both the steam tractor and the steam road roller are rapidly being supplanted by those having gasoline engines, so there does not seem much chance for the steam motor truck.

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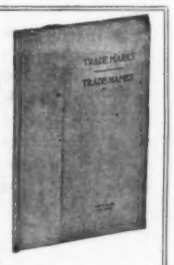

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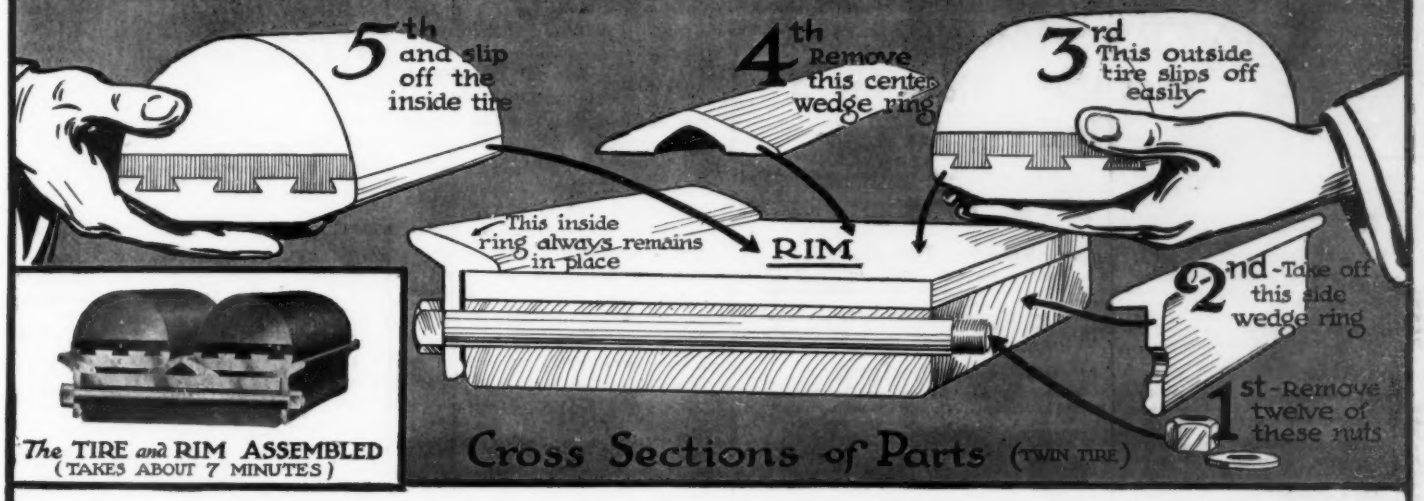
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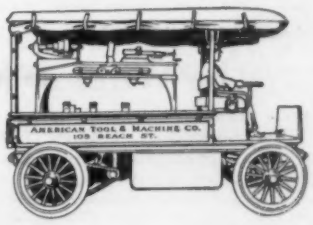

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Asphalt Still a Mysterious Material

(Concluded from page 460.)

itself had more of a quasi-scientific interest rather than a practical one, and not until the nineteenth century was any industry again based upon it or the application of it revived. At the present time, however, it is considered to be the best street paving material available.

The ancients gathered their asphalt from the Red Sea, which to this day produces a minor quantity, but the largest portion of the world's supply comes from Trinidad, Venezuela and Cuba. Trinidad asphalt, although at first used as a substitute for coal tar, and an improvement on it in roofing and like purposes, is the substance now generally used in the United States for street paving, and of the fifty millions or more of square yards laid in the country, it is estimated that at least seventy-five per cent of this is a mixture in which Trinidad asphalt forms a part. The deposits of the pitch lake in Trinidad occupies a bowlike depression of about a hundred and fifteen acres, which is probably the center of an extinct volcano. The center of the lake is not quite a mile from the Gulf of Paria and is about one hundred and thirty-five feet above the level of the sea, and its contents are of remarkable uniformity, and its surface is in constant motion, there appearing at times what may be termed currents and eddies. The middle of this wonderful lake is about one foot higher than the edges, this relation being maintained, although the body as a whole has been lowered by the constant removal of material. There is an overflow from the lake to the sea through a crevice in the rim, and this stream is from 15 to 18 feet deep, but beneath this stream is a ravine still filled with asphalt, which seems to have no limit to it. The asphalt that comes from Trinidad is too brittle for direct use on the streets, and must, therefore, be mixed with other material before it is finally used for paving. The depth of the lake at Trinidad is supposed to be about one hundred feet, although the actual bottom of the crater-like depression has never been reached. The pitch itself can be picked up and molded without soiling the hand; but one of the most peculiar characteristics of this strange body is that the deposit renews itself almost as soon as it is removed.

The asphalt lake in Venezuela is situated across the Gulf of Paria about 105 miles due west of the Trinidad lake. This body covers an area of about one thousand acres, being nearly nine times as large as that of the lake at Trinidad, however its deposits are only a few feet deep in some places. So not only is the supply from Venezuela not nearly so great as that of Trinidad, but it differs from it, as it is not always uniform and at times is softer, but notwithstanding this difference in quality some scientists claim that the two lakes are geologically connected. Cuban asphalt comes from various parts of the island, and in one location, the Bay of Cardenas, it is actually drawn up from the bed of the bay itself, through eight or nine feet of water. The surface of an asphalt lake, except for small wooded islands, is bare of vegetation and hard enough to bear foot traffic or even carts in the cool of the morning, while by the aid of a sort of corduroy road made of palm branches it supports a cable tramway. The work of mining asphalt is suspended during midday as the stuff becomes to hot to work with; in fact, an asphalt lake is said to be the hottest place on earth.

Geographic distribution of asphalt or its allied bitumens is a well-classified phenomenon, although new sources have been discovered from time to time, the search for coal and petroleum often revealing a hitherto unknown bed in an unsuspected part of the earth. In Egypt deposits of a very pure asphalt occur and have perhaps been known since the beginning of history, and from an immemorial period asphalt has been cast up by the Dead Sea which, at times, has been exploited commercially. In Asia Minor, Persia, and the valleys of the Euphrates and Tigris

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rivers valuable deposits are also found. Solid bitumens are found in many places in the United States, along the Connecticut River, in New York State, in New Jersey, and in West Virginia. Beds of the material exist in Texas, and veins have been discovered in Utah, Colorado, Missouri, Kentucky and in California, those in the last named State and in Texas being the most important. The advent of the motor car has caused asphaltic streets to become more and more popular the world over, and with the improvement in preparation, together with the cheapening of the product as larger supplies from new deposits become known, even cities in the Far South can now depend upon the firmness and economy of asphalt for street paving.

The Heavens in December

(*Concluded from page 462.*)

past opposition, and is a splendid object in the evening sky, appearing fully equal to Capella in brightness. His rings are now apparently opened at a wide angle, and he well repays telescopic study, even with a very small instrument.

Uranus is in Capricornus, too low in the west to be observed, even early in the evening.

Neptune is in Gemini, as illustrated on our chart.

The Moon is in her last quarter at 4 A. M. on the 1st, new at 10 A. M. on the 8th, in her first quarter at 1 P. M. on the 16th, full at 10 P. M. on the 23d, and in her first quarter again at 1 P. M. on the 30th. She is nearest us on the 25th, and farthest away on the 14th. In her circuit of the sky she passes near Mars on the 7th, Mercury on the 8th, Jupiter on the 9th, Venus on the 11th, Uranus on the 12th, Saturn on the 21st, and Neptune on the 25th.

At 11 A. M. on the 21st the Sun reaches its greatest southern declination, and in almanac parlance, "winter commences;" while at 8 P. M. on the 31st the Earth passes through that point in its orbit which is nearest the Sun.

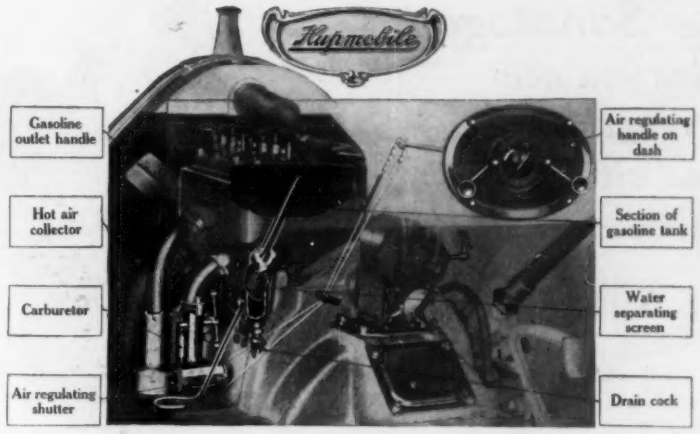
Princeton University Observatory.

Public Support of the Aeroplane Fleet in France

THE following data have been issued concerning the funds collected by public subscription for the French aeroplane fleet and also the credits voted by Parliament for the same purpose. For the budget of 1912, Parliament voted the sum of $1,500,000, to which is to be added the funds raised by subscription, or $348,000, making a total of $1,848,000. This sum has been employed as follows: Aeroplanes ordered and paid before October 1st, 272; orders pending from now until the end of the year, 90 aeroplanes. This will give a total of 362 aeroplanes purchased with the above amounts during 1912.

As concerns the purchase of aeroplanes by the French army, the authorities have made an interesting decision lately. Starting from October 1st, a new commission will carry out this work, and its object is to decide upon the number of aeroplanes to be purchased according to available funds. It is composed of Colonels Bouttieaux, Etienne and Breton, chiefs of aeronautic centers. It will hold meetings twice a year and make out the order lists for the next six months so as to bring about a regular production and not overcrowd the factories. The formerly existing aeroplane commission will now be limited to examining the specifications and reception of aeroplanes. In short, the first commission is occupied with the number of machines and the second with their quality. By next year the army expects to have three types of aeroplanes in use, a very rapid machine for single pilot which can readily be displaced, then two-place machines for scouting trips of some length, besides armored aeroplanes provided with guns.

ACCORDING to the *London and China Telegraph* a project is on foot to build a railway on the wall surrounding the city of Peking.



How this Self-Priming Device *makes* cold-weather starting easy

The Hupmobile gasoline system—pictured above and explained in the text—shows many distinctive features of motoring convenience that are well worth your notice.

Study especially the hot-air control and self-priming device.

By these you are enabled to start your motor in cold weather almost as easily as you do in summer.

This device, together with the direct fuel feed; the gasoline cleansing screen; the emergency supply; go to make a system as complete as engineering skill can accomplish.

We lay stress on it here because it is characteristic of the thoughtful and painstaking skill in designing that is evident in every detail of Hupmobile construction.

It is but one of many instances we can show you to justify our belief that the Hupmobile is, in its class, the best car in the world.

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How the Automatic Primer Operates

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We have done away with both of these troublesome methods by supplying the Hupmobile carburetor with an automatic primer.

The air supply to the carburetor is controlled by a shutter, operated by a handle conveniently placed on the dash.

By turning this handle the quantity and temperature of the air passing through the carburetor can be regulated.

For starting in cold weather the air shutter is nearly closed and a mixture very "rich" in gasoline is drawn into the cylinders.

This comes from the carburetor nozzle as a very fine spray, making it easier for the spark to explode than in the car of ordinary priming with liquid gasoline.

All air passing into the carburetor at starting is drawn through the hot air collector and heated by the exhaust piper, so that the engine gets under way almost as quickly and smoothly as under more favorable weather conditions.

Another advantage of the Hupmobile gasoline supply is the location of the tank under the dash shrond, so that gasoline is positively fed to the carburetor by gravity, whether on the level or hill.

On its way to the carburetor, the gasoline passes through a screen so fine that the water and dirt are separated from it.

Just below the screen is a valve, operated by the gasoline outlet handle, which can be set to keep one gallon of gasoline in reserve for an emergency.

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"32" Delivery, fully equipped, $950 f.o.b. Detroit
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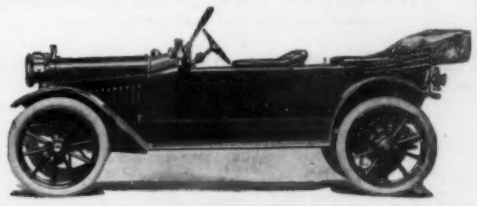

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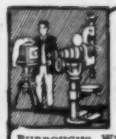

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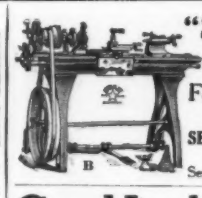
(12708) V. F. S. asks: Will it ever occur that the four planets in order of distance from the earth, i. e., Venus, Mars, Jupiter and Saturn, assemble in our western sky one or two hours after sunset together with our inseparable moon? I am not an expert in astronomy, but such display does not seem to be impossible, as I well remember when in my teens having once viewed Venus, Jupiter, and Saturn, the three planets not very far from the moon six or eight days old. A. An astronomer can trace a planet backward or forward and find when it has been or will be in a certain position with reference to the sun and earth, and also when any number of other planets will be in the same position. At some time the four planets which you name will be in the western sky together with the moon. The same conjunction will recur at regular intervals, as it has done in the past. The interval will be the least common multiple of the intervals required by each of these planets to come to this position.

(12709) J. W. S. asks: I have lately been reading in a newspaper a long account of a "rain-maker," or in other words of a man who is supposed to be able to produce rain in any part of the world at any time; indeed, according to the article (it is not an "ad") he has never been known to fail. Can you, through the medium of your paper, tell me whether there is any truth in this statement, or whether it is mere romancing? A. We have no reason to doubt that the gentleman whom you name in your letter of inquiry is a reality, and that he is in the business of "rain-making." That he can actually cause a rainfall is quite another matter. We do not believe that. The United States Weather Bureau has many times given its opinion that the production of rain at a time when it would not otherwise have fallen cannot be brought about by any means in the power of man. The enormous weight of air in a storm cloud of even moderate extent prevents our believing that a discharge of powder or dynamite can affect the cloud. Even if a great shock could be given to the air, there is no reason to believe that a shock can condense water vapor to water drops, producing a cloud in clear air and causing a downfall of rain from the cloud thus formed. Water vapor is not condensed into water by a shock. It is condensed by cooling. The popular notion that rain is caused by great battles or other explosions is regarded by scientific men as entirely erroneous. In reference to this matter, Prof. Moore, Chief of the United States Weather Bureau, recently wrote to one of our papers. He said: "If such attempts held out the slightest prospect of success, the Weather Bureau would give them every encouragement. Moreover, if rain-making were merely a harmless popular delusion, this bureau would not feel called upon to take an active part in opposing it. This, however, is far from being the case. The advocates of rain-making, whether acting in good faith or from some selfish motive, have already been responsible for the waste of a great deal of money on the part of the public, and at present a deliberate propaganda appears to be in progress in behalf of these extravagant and absurd undertakings." This would appear to be a sufficiently positive opinion by the man most likely to be informed.

(12710) C. de S. says: 1. It is claimed that a mixture consisting of 1 cubic meter oxygen with ¾ cubic meter acetylene will, when burnt, produce a heat of 3,600 deg. Cent. Is this correct? A. The temperature of the oxy-acetylene flame is given as 3,500 deg. Cent. The combustion of a cubic meter produces 13,568 calories. 2. Of how much oxygen and acetylene (the acetylene being of the quality as generally used for autogene soldering) should the mixture consist in order to produce a heat of 1,600 deg. Cent.? A. The quantity burned does not affect the temperature of the flame, if the combustion is complete. A small flame has very nearly the same temperature as a large one. Imperfect combustion would reduce the temperature of the flame, but we could not give any rule for producing a temperature of 1,600 deg. Cent. 3. How many heat units or calories are developed by *one gramme* of oxygen and acetylene, and of how much oxygen and acetylene respectively does this one gramme consist? A. We have not the data at hand for determining the calories produced by the burning of one gramme of acetylene and oxygen mixed in the proper proportions for complete combustion. The value of a cubic meter of acetylene in calories as we gave it above is the ordinary way of stating the question. 4. The SCIENTIFIC AMERICAN of August 3rd, 1912, brings interesting information regarding the electrical production of pig iron. It would be very interesting to know the *cost per kilowatt hour,* also, which those trials at Trolhatten established. This cost will, of course, be different at different places, but would, nevertheless, serve as a valuable basis for us, and I would therefore be grateful if you would kindly inform me these costs also. A. We have no report which gives us the cost of electric power at Trolhatten, but you can doubtless obtain the figures from the Swedish consul at your place or by writing direct to Trolhatten, Sweden.



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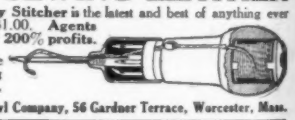

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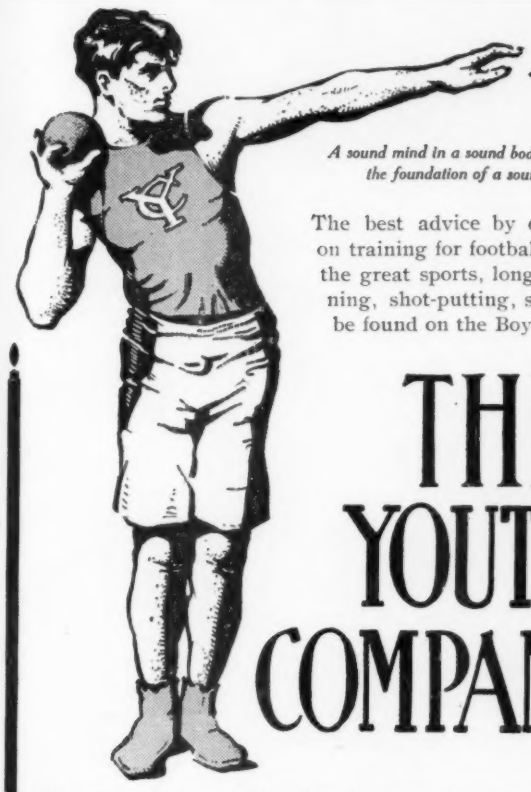

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We are Extending to our Colonists the kind of **Co-operation** that **Co-operates**—building Bridges, making Roads, and Ditches, etc., and have Expended nearly Fifty Thousand Dollars the past Summer in such Improvements. More than Ten Thousand Acres have been Sold during the past ten Months to Satisfied Purchasers, because we have a proposition that can Stand Unashamed beneath the Spot Light of Publicity, and Where Your Days of Prosperity Shall Be Long Upon the **Land.** We are selling Real Land and not Sand—**Get That**—a Rich, Loamy, Black Soil, that **You Could'nt Wear Out in a Hundred Years.**

I believe you could save Twenty-five Cents a Day if You tried. I know you would Try if you Realized that our Growers of Figs, Strawberries and Early Vegetables clear a net profit of $300 to $500 an Acre. Men have Realized more than $1,000 an Acre growing Oranges in our Country. Remember that our Early Vegetables get to Northern Markets in Mid-Winter and Early Spring, when they command Top Prices.

One German Truck Grower on adjoining lands this Spring realized nearly $500 from three-fourths of an acre of Strawberries. You could do as well if you only Tried, and on a Ten-Acre Tract **Find Financial Freedom.**

The Biggest Price paid for a car of watermelons on the Houston Market this year was $140. The car was shipped by the Danbury Fruit and Truck Growers' Association.

We are situated within convenient shipping distance of Three Good Railroads, and in addition to this have the inestimable Advantages of Water Transportation through the Splendid Harbors of Galveston and Velasco, so that our Freight Rates are Cut Practically in Half. The Climate is Extremely Healthful and Superior to that of California or Florida — Winter or Summer — owing to the Constant Gulf Breeze.

Our Contract Embodies Life and Accident Insurance, and should You Die, or become totally disabled, Your Family, or anyone else You name, will get the Farm without the payment of Another Penny. If You should be Dissatisfied, we will Absolutely Refund your Money, as per the Terms of our Guarantee.

Write for our Free Book, which contains nearly 100 Photographs of Growing Crops, etc. Fill out the Blank Space below with your Name and Address, plainly written and mail it to the Texas-Gulf Realty Company, 1304 Peoples Gas Building, Chicago, Illinois. Read it Carefully, then use your own Good Judgment.

Please send me your book, "Independence With Ten Acres."

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For fifteen years the Scientific American has published an ANNUAL MOTOR NUMBER in which it has presented the most advanced information on developments in motor car design and construction.

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